THE MODEL ENGINEER

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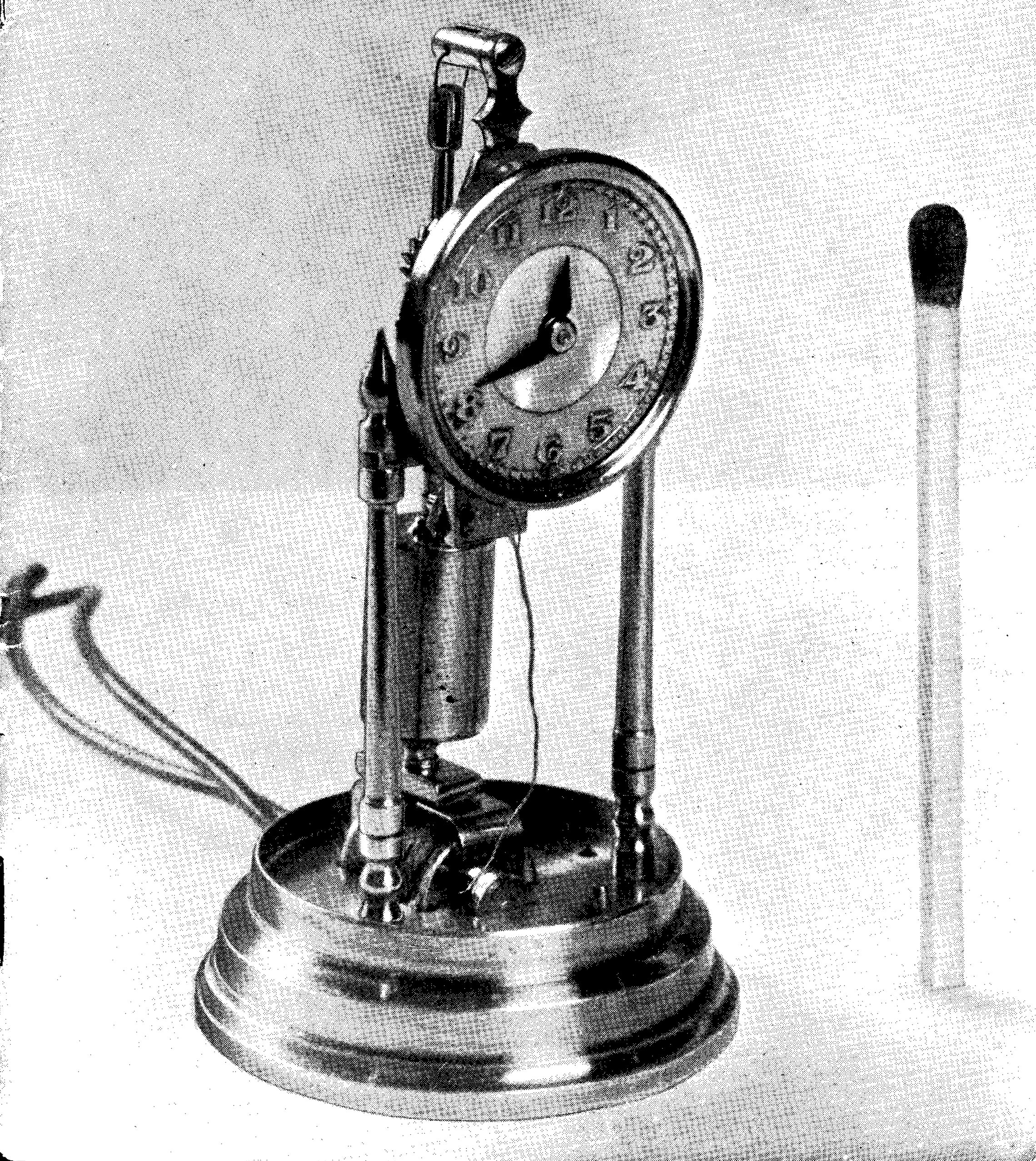


The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

29TH JUNE 1950 VOL. 102 NO. 2562

SMOKE RINGS

The "M.E." Index

● DURING AND since the war, the restrictions on the supply of paper made it difficult to incorporate the index in THE MODEL ENGINEER at the completion of each volume, but it has been supplied separately at readers' request. We are now happy to announce that it is again possible to revert to our previous practice, and the index to Volume 102 is contained in this week's issue ; unless any unforeseen emergency arises to prevent it, we shall continue to do this in future volumes.

On Getting Stale

● THERE IS a tendency amongst model engineers to get into a groove and by concentrating overmuch on one's own particular interest to continue working it out until one gets stale. The annual summer holiday can be a great corrective in this matter. If when he goes away the modeller can forget for a time the work on which he is engaged, and detach his mind from its usual line of thought, he will see many things to widen his interest and enable him to appreciate more fully the value or otherwise of his particular branch of the hobby. The locomotive man might see an old paddle steamer or a smart new cross-channel packet which shakes him out of his groove, or he might even come across an old Victorian locomotive which charms him by its beauty in contrast to the overwhelming sense of power and might which exudes from the modern locomotive. Then again, the ship modeller might get away into the country and the hills and see a traction engine driving a threshing mill and acquire a new interest in things. We do not suggest for a moment that the model maker should flit airily from one subject to another ; in this way he will accomplish nothing, but the great thing to avoid is seeing only one thing in life. Concentrate, by all means, but not to the exclusion of everything else. Keep an open mind and a detached view and your work will have a freshness and a rightness which it would lack otherwise. Also, you will be a better model engineer and a greater help to your model engineering society if you learn to take an interest in all phases of model engineering.

Stationary Steam Engines

● MANY READERS have written to us supporting the plea recently made for authoritative information on the modelling of stationary steam engines

of various periods. We have long been aware of this demand, but it is not so easy to satisfy as some of our readers seem to imply. Accurate details of period steam engine design are not easy to obtain at the present day. Previous to the war, we possessed a very fine reference library, which included many old standard textbooks on the steam engine, with the excellent drawings characteristic of these old books, such as are rarely seen in modern publications. But the complete obliteration of the "M.E." offices during the war deprived us of this source of information, and although we are doing our best to rebuild a stock of reference books, some of the old and treasured textbooks, alas! cannot possibly be replaced. It would be quite easy to draw upon memory, aided by imagination, to reconstruct designs of old-time engines; but we feel that this would hardly satisfy the requirements of our many readers who are connoisseurs of vintage engine practice and sticklers for accuracy. Several of our readers have done their best to help by sending us photographs of old engines which are still in existence; but photographs, however good, rarely furnish sufficient detail to provide the basis for design Readers interested in the construction of such engines demand drawings which give full information of all details, both internal and external.

The "M.E." as a Tonic

● ONE OF our West Country readers, in a letter dealing with the above subject, informs us that in a recent serious illness, THE MODEL ENGINEER has not only been a solace but also a tonic. He states: "I should like to let you know how much THE MODEL ENGINEER has helped me during my illness. I look forward to it each week, and the specialist has told me that although almost all activity is forbidden, I may 'fiddle about' with my lathe and do very light work in the workshop; I am sure this is the best way to get better." This is by no means an isolated example of the way in which model engineering has, to our certain knowledge, helped to restore health. Nowadays, the value of "occupational therapy" is fully recognised by the medical profession; but a creative hobby does more than give limbering-up exercise for both the body and the mind; it provides a real interest in life and a keen incentive to recovery, which as any doctor will confirm, is worth all the drugs in the British Pharmacopœa.

Model Motor Racing in Grimsby

● THE GRIMSBY and District Society of Model and Experimental Engineers are at work preparing their 70 ft. diameter track near the pumping station for their opening event which is scheduled to take place on August 27th.

The preparation of a miniature race track involves a fair amount of work if the surface is to be up to competition standard, and it is almost a certainty that many members will be putting in long hours at weekends and in the evenings.

It would be a very nice gesture if those readers living in the Grimsby area who contemplate the future use of this track would contact the hon. secretary and offer to lend a hand. His name is Mr. J. Tarttelin, and his address, 101, Ladysmith Road, Grimsby, Lincs.

Photographing Models

● THIS IS a rather hackneyed topic but judging from the quality of the photographs which are usually sent with the models entered for THE MODEL ENGINEER Exhibition there are still a few points on which a little advice may be helpful. It is not always possible to have a plain background but in such cases the model can be brought forward from the background when the difference in focus will help to separate it from the background. Often the photographer forgets that the model is intended to simulate the real thing and treats it only as a model. This accounts for the almost aerial view one often gets. The better plan is to look at the model from the level at which you would see the real thing. For example, a model ship should be taken from a level just a little above the waterline and a model locomotive from platform level or even rail level. In this way they are much more realistic and more representative of the prototype.

British Railways (Eastleigh) M.E.S.

● WE ARE very pleased to have received a long letter from Mr. R. M. Lewis, the hon. secretary, to inform us that British Railways (Eastleigh) Model and Engineering Society is thoroughly well established. Some four years ago, Mr. Lewis wrote to let us know that there was a proposal on foot to form such a society in the Locomotive and Carriage Works at Eastleigh, and he asked for certain advice and information which we were glad to give.

Soon afterwards, apparently, the idea was rapidly brought to a successful conclusion, with the result that, today, there is a workshop and clubroom complete with lathes, drilling and shaping machines, a technical library of some 1,500 volumes formed and installed in the local Public Library, due to the co-operation of the local Council. There are, also, a cine-projector, an epidiascope, a lantern for "stills" and other equipment and facilities comparable with those of other societies, and there are nearly 200 members.

This is, indeed, a highly satisfactory state of affairs, and we are fairly certain that this venture was the first of its kind to be brought into existence on the railways; in fact, the only other one of which we have knowledge is the more recent one formed at Old Oak Common, Western Region, depot.

The past winter programme was most successful, papers by members, film shows and lectures all being well attended. Already, the summer programme, which is a very full one, has opened with a visit to the locomotive works of the French Railways at Sottville, Rouen. A party of sixty travelled via Southampton-Havre on a Friday night, enjoyed a ramble round the old town of Rouen, then a coach tour of the district, back to the locomotive works, returning to England on the Saturday night.

Good progress is being made in the construction of model railway layouts in the clubroom, as well as outdoor track for live steamers.

All this indicates that there is plenty of active enthusiasm among the members, and we look forward to hearing more news of further progress and success.

An Ultra-Miniature Electric Clock

by Stanley J. Wise, F.B.H.I.

(*Foreword by the Technical Editor*)

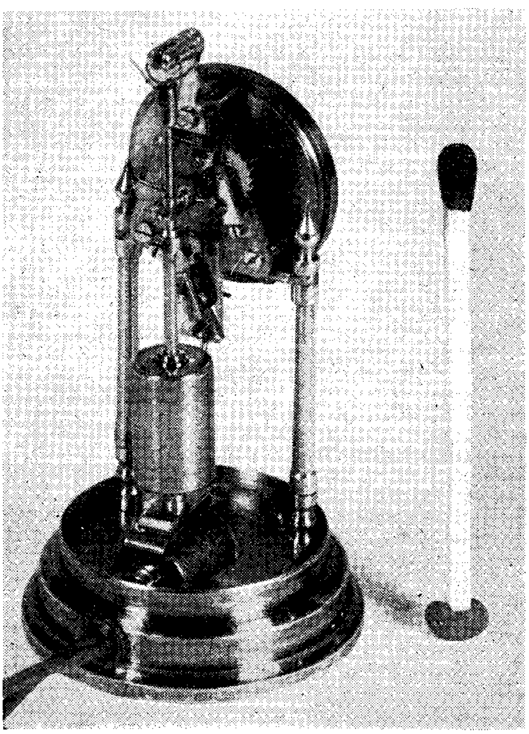
We all know the legend of the needle-maker who, having produced "the smallest needle in the world," sent it to a rival manufacturer for his approval—it was returned to him with three needles threaded through the eye! There are several versions of this story, but whether any of them is true or not, the obvious moral is that anyone who claims to have produced the "smallest ever" model or article of any kind must be prepared to have his claim challenged. For this reason, we will not be so rash as to assert that the electric clock described here is the smallest in the world—but we are quite certain that it is the smallest we have ever seen or heard of. It is, in fact, something more than a mere example of miniature clock mechanism, as its design, although following established principles as employed in larger electric clocks, embodies many novel and ingenious details which have been worked out experimentally to cope with the many problems which arise in applying electric power to such a tiny clock.

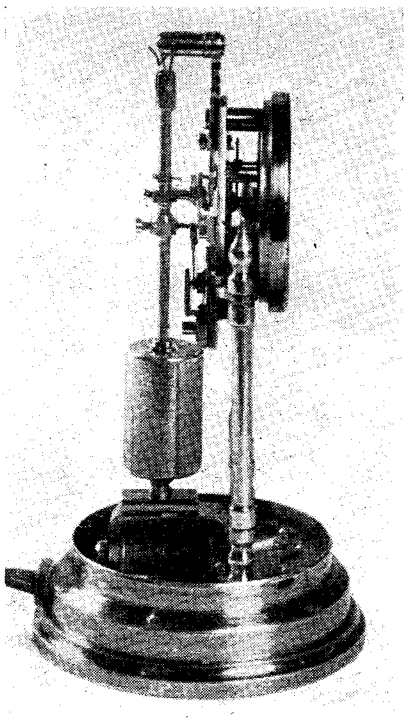
The constructor of this clock, whose articles on electric clocks have been a source of interest to many of our readers, has not only produced many unique examples of electric clocks of all types, some of which we hope to describe in future issues of THE MODEL ENGINEER, *but he has also succeeded in driving a wrist watch by electrical means. Whether our readers are interested in ultra-miniature models, horology, or electric mechanisms, we feel sure that the articles on these subjects are universally appreciated as examples of ingenuity and good workmanship. Moreover, the practical success of such devices provides further proof—if proof be necessary—that the contributors to* THE MODEL ENGINEER *are craftsmen who practise what they preach.*

ALTHOUGH many types and designs of electric clocks have been described in the past and present, in no instance to my knowledge has a miniature actual working model of the above ever been attempted.

The tiny clock about to be described took a year or so to complete, and is, I have every reason to believe, the smallest pendulum model in existence.

It will no doubt be appreciated, especially by

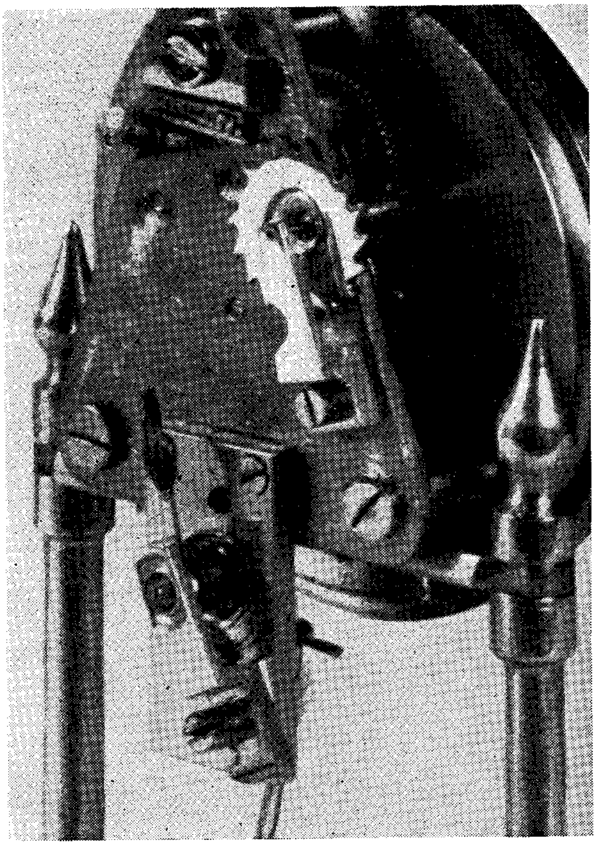




electrical readers, that to attain success with such a tiny mechanism presents a very difficult problem indeed, and it is due, in no small measure, to experience gained by the writer on research in electrical propulsion of small watch balances that made the construction of this tiny power unit possible. The chief difficulty in operating such a small mechanism electro-magnetically is the fact of insufficient working forces to perform both pendulum propulsion and wheelwork functions, with a minimum of battery energy.

It is a well-known fact that working forces of an electro-magnetic system diminish progressively as the working coil gets smaller; for example with such a small coil as that incorporated in the present system the overall efficiency, or order of merit, falls off practically as an inverse square of the coil dimensions, in comparison to say, an electro-magnet large enough to operate a full sized clock. One is left, therefore, with an almost microscopic amount of energy to perform the double function of impulsing the pendulum, and propelling the wheelwork.

It was found in practice that considerably more energy was normally expended in performing the latter function than was required in impulsing the pendulum.



An enlarged view of the mechanism, with pendulum removed

Pawls

For reasons stated above, it was found (due to friction) impossible to fit return springs, however light, on either the backstop, or propulsion pawl, both of which depend upon pendulum operation; this difficulty, however, after many failures, was overcome by constructing both pawl members from magnetic steel of high flux density, both being carefully balanced and polarised. This miniature pawl assembly is so arranged as to allow the *nose only* of each pawl to *react with the ratchet teeth magnetically* without actually touching any part other than *the extreme tips of the teeth.* By this means all friction is reduced to a negligible amount and the difficult problem of wheelwork propulsion is solved.

The system of pendulum impulsing is bi-directional each side of the zero line and is operated through the medium of a fixed two-pole electro-magnet reacting with a small "stalloy" armature attached to the lower end of the pendulum rod.

The contact switch lever is supported in jewelled bearings and arranged to "wipe" its mating pin, carried by the pendulum, at each side of the zero line for a period of approximately 1/50th second, which is sufficient to maintain amplitude.

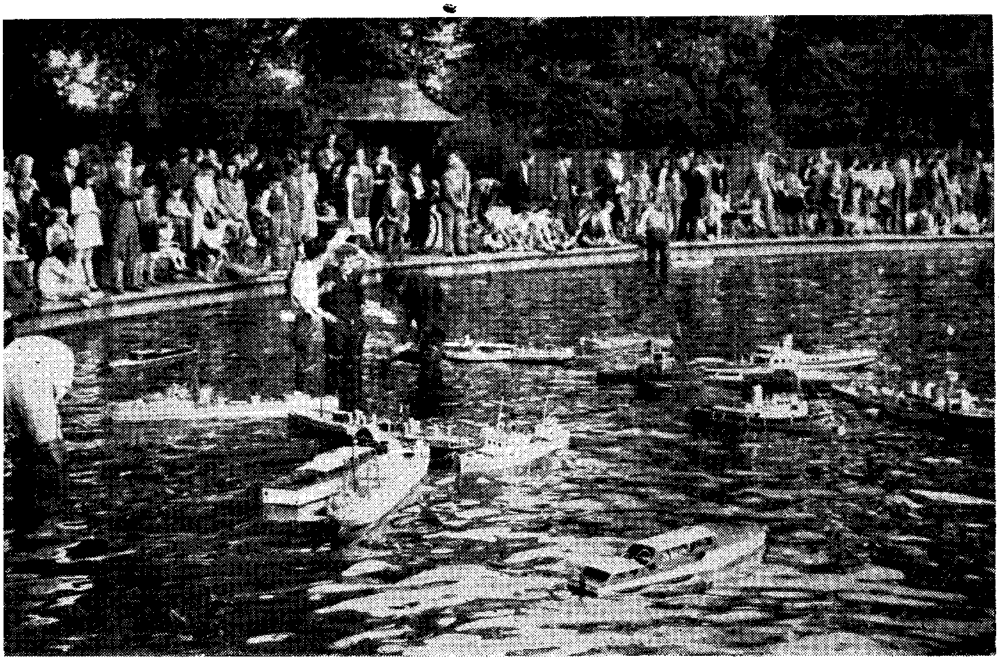
I have had this tiny clock working for about two weeks, during which, a time variation of about three minutes per day was recorded; this error, however, can be greatly improved by careful adjustment of the impulsing period to decrease the arc slightly by introducing a small retardation effect on the free arc only, that is the arc when the wheelwork is *not* being propelled.

Dimensions

The main dimensions of the clock are as follows:—

(1) Height from top of base to uppermost point of dial, $1\frac{5}{8}$ in.
(2) Diameter of dial, $\frac{5}{8}$ in.
(3) Width across columns, $\frac{3}{4}$ in.
(4) Distance apart of wheel plates, $\frac{1}{8}$ in.
(5) Diameter of supporting columns at base 3/32 in., and 5/64 in. at upper ends.
(6) Width of contact switch mounting plate 5/32 in., and height $\frac{5}{16}$ in.
(7) Attachment screws for above contact plate, 0.05 in. in shanks.
(8) Working coil $\frac{1}{4}$ in. long (over winding) and 7/32 in. diameter.
(9) Number of turns on above coil, 1,500 of 0.0016 in., or 48-s.w.g. wire.
(10) Resistance of coil about 500 ohms.

(*Continued on page* 938)



A typical scene at the Victoria Park Regatta

The Victoria M.S.C. Regatta

WHENEVER a regatta is due to be held at Victoria Park, the organisers hope for the best as far as the weather is concerned, for it seems to work out that Victoria Park gets more than its fair share of rain.

On the occasion of the Victoria Model Steamboat Club's annual M.P.B.A. Regatta, this venue lived up to its rainy reputation at the start of the event, but happily soon cleared up and by the afternoon it became really warm. In spite of a very good turnout of boats of all types it has to go on record that there seemed to be a hoodoo at work in the speed classes, only a few boats completing the 500 yards necessary

The Nomination Race

The regatta opened with the usual Victoria 80 yd. Nomination Race, and this was well supported by entries from Swindon, Enfield, Blackheath, Orpington, Kingsmere and Croydon Clubs, besides the home club. This must have been one of the most closely contested nomination events ever held, the winner returning a correct nomination and third place winner being only ½ sec. out in 22.

The competitor with the correct nomination was A. Rayman, of the Blackheath Club, and the runners-up, Messrs Newcombe and Mitchell of Victoria.

The next events were to have been for the "C" Classes, but as there were several "D" class boats present, it was decided to run an event for them, but sad to relate, no boats finished the course! This was rather an ominous sign, for upon the arrival of the Class "C" and "C" restricted boats, this performance was almost repeated. In the "C" class, L. Pinder (Malden) could not get his engine started and J. Benson's *Moth* petered out on both attempts. The "C" restricted competitors fared a little better both A. W. Stone (S. London) and Mr. Ridley (S. London) returned speeds of about 40 m.p.h. for the distance, although both these competitors' boats speeded up after the timing had finished. Mr. Ridley's boat *Marie* is new to racing and looks very promising. Of these two boats, A. W. Stone's *Toots* recorded the best time 24.7 sec. for 500 yd. (41.4. m.p.h.).

The Steering Competition

As the regatta had started a bit late it was necessary to eliminate the lunch interval and continue straight on with the Steering Competition.

The scoring in this event was marked by a tie in which four contestants, Messrs. Kirkham and Hood (Swindon) "Bill" Blaney and A. Evans (Victoria) each scored 11 points. In order to sort out the winner two re-runs were necessary. The winner was G. Kirkham with his steam launch, while the unlucky one was A. Evans with his steam tug *Maycock*.

The 500 yd. Class "B" Race brought forth

several well-known competitors, but although some promising starts were seen, all were dogged by trouble. F. Jutton (Guildford) with his flash-steamer *Vesta II* capsized on both runs at high speed. The alterations made to the planes recently have caused a tendency to "diving." G. Lines (Orpington) with *Sparky II* started well enough, but the boat stopped after one lap with a broken universal joint, which damage put *Sparky II* out of the running. Another unlucky boat was *Green Vixen* owned by H. Collins (Victoria), which failed to finished on either attempt. It was left to a newcomer to speed events, M. Hodges (Orpington) with *Spartan* who made a run of 33.95 sec. and E. Walker (Kingsmere) with *Petite*, 44.7 sec., to be the only boats in this race to return a time.

More Misfortunes

The last event a 500 yd. Class "A" Race was a repetition of the previous misfortunes. The only competitor to finish was E. Clark with *Gordon II* and then at a comparatively low speed. On a second try *Gordon II* put in $4\frac{1}{2}$ laps at about 50 m.p.h. before cutting out.

Another boat to have trouble was *Betty*, owned by J. Innocent. Released at rather a sharp angle, *Betty* cut almost straight across the course until brought up by the line, unfortunately this jerk broke the steel-wire bridle and the boat went head-on into the bank. As a result of this the hull was stove in, and the engine torn from its mounting. A new boat by B. Miles (Kingsmere) having a 30 c.c. two-stroke engine put up two sensational runs, each of which culminated in a capsize. Another new boat, by E. Coward (Kingsmere) has an Atom "5" engine installed and looked as it if might well be developed to give an improved performance at a later date.

The speed events, the results of which look rather disappointing were nevertheless interesting enough to witness, and combined with the efforts of the steering boats made yet another successful Victoria regatta.

Results :

Nomination Race 80 *yds.*—1. A. Rayman (Blackheath), *Yvonne* : est. time 14 sec., actual time 14 sec, error nil. 2. A. Newcombe (Victoria), *V48* : est. time 24 sec., actual time 24.25 sec., error 1 per cent. 3. J. Mitchell (Victoria), *Glen Helen* : est. time 22.5 sec., actual time 23 sec., error 2 per cent.

"*D*" *Class Race*, 500 *yds.*—None finished.

"*C*" *Class Race*, 500 *yds.*—None finished.

"*C*" *Restricted Race*, 500 *yds.*—1. A. W. Stone (S. London), *Toots* : 24.7 sec., 41.4 m.p.h.

Steering Competition.—1. G. Kirkham (Swindon), *Lady Windsor* : 11 + 5 + 3 points. 2. W. Hood (Swindon), *Truant* : 11 + 3 + 1 points. 3. W. Blaney (Victoria), *Lil' Man:* 11 + 3 + 0 points.

"*B*" *Class Race*, 500 *yds.*—1. N. Hodges (Orpington), *Spartan* : 33.95 sec., 30.0 m.p.h

"*A*" *Class Race*, 500 *yds.*—1. E. Clarke (Victoria), *Gordon II* : 30.9 sec., 34 m.p.h.

An Ultra-Miniature Electric Clock

(*Continued from page* 936)

(11) Length of pendulum from axis of oscillation to centre gravity of bob, $1\frac{1}{4}$ in.
(12) Vibrations of pendulum, 360 per minute.
(13) Weight of clock complete with base, slightly less than $\frac{1}{2}$ oz.
(14) Length of contact switch lever, from axis to tip, $\frac{3}{16}$ in.

Wheelwork Dimensions

(*a*) Number of teeth on propelled ratchet wheel, 18 ; with a pinion of six leaves makes one revolution in six seconds.
(*b*) Fourth wheel contains 60 teeth and therefore rotates once per minute. Pinion here of eight leaves.
(*c*) Third wheel has 60 teeth and makes one revolution in 7.5 minutes. This wheel also contains a pinion of eight leaves.
(*d*) Centre wheel with 64 teeth performs one revolution per hour.

Total ratio from propelled wheel at 360 vibrations per minute, $\frac{10}{1} \times \frac{7.5}{1} \times \frac{8}{1} = \frac{600}{1}$

Wheel and Pinion Data

(*a*) Diameter of ratchet wheel pinion, 0.02 in. !
(*b*) Diameter of fourth wheel, 0.2 in., with a pinion of 0.032 in. diameter !
(*c*) Diameter of third wheel, 0.24 in., with a pinion of 0.032 in. diameter.
(*d*) Centre wheel 0.256 in. diameter.
(*e*) Diameter of all pivots except centre wheel, 0.005 in. !

The remaining points are clearly shown on the excellent photographs reproduced herewith, along with the one on the cover of this issue, which were kindly taken by the Editor and staff of THE MODEL ENGINEER, on which occasion it gave me much pleasure to submit my model for their examination.

Now to all horological enthusiasts I say "what about it," why not have a go ?

Novices' Corner

Using the Lathe for Tapping Large Holes

IT is sometimes necessary to thread large holes in work already mounted in the chuck or on the lathe faceplate. Usually, such threads would be formed by a screw-cutting operation, but there are many occasions when the accuracy of the thread fit is not of great importance, and all that is needed is that the threading should be in axial alignment. There is then but little point in resorting to the relatively slow operation of screw-cutting when tapping will serve equally well.

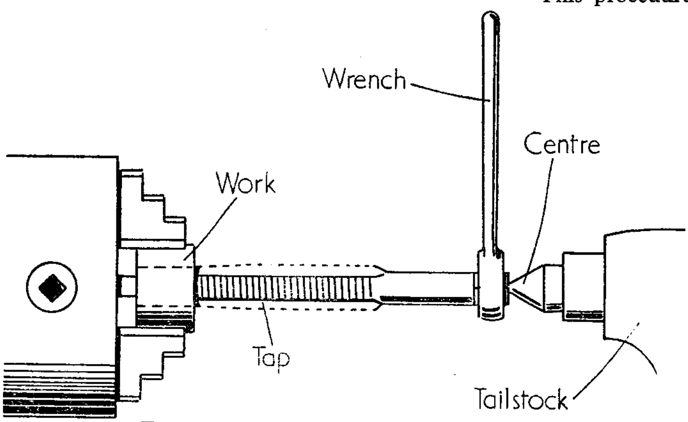


Fig. 1

The class of work for which this practice is suitable is exemplified by the ¾ in. × 26 t.p.i. hole formed in an angle-iron bracket as was described in last week's "Novices' Corner." The purpose of this hole, it will be remembered, was to accommodate the threaded foot of a large pressure-gauge; the threaded parts need not therefore fit closely, but the thread must be formed square with the face of the bracket.

As the parts are not subject to strain, a thread engagement of 50 per cent. is ample; that is to say, the thread in the bracket need only make contact equal to 50 per cent., or one half, of the thread depth on the foot of the pressure-gauge. Consequently, the hole in the bracket may be bored larger than the standard tapping size, thus leaving less metal to be removed by the tap.

In passing, it should be noted that full information about the depth of engagement of screw threads and the most suitable size of tapping drills to be used with various classes of work is given in *Screw Threading and Screw Cutting*, recently published by Messrs Percival Marshall & Co. Ltd.

The method of tapping holes from the lathe tailstock was described in a previous article; briefly, this consists in supporting the shank of the tap in the tailstock drill chuck and then either turning the tap while the lathe mandrel remains locked, or keeping the tap stationary and rotating the mandrel by hand.

This procedure will be found to answer well when tapping small holes or cutting fine-pitch threads; but where larger threads have to be formed, greater leverage may be required to increase the cutting pressure. However, when great pressure has to be applied to the tap, care must always be taken to ensure that excessive strain is not applied to the lathe parts. Should there be any doubt in the matter, it is safer to give the tap a true start in the lathe and then to transfer the work to the bench vice for finishing the tapping operation.

For heavy tapping two methods may be used. In the first, the centre formed in the tap shank is engaged with the tailstock centre, and, after the lathe mandrel has been locked, the tap is turned by means of a wrench applied to the squared portion of the shank. The tailstock feed is used to maintain the necessary tapping pressure, and as the tap advances into the work the tailstock must also be fed forwards to keep the tap correctly aligned. If the tap is moved to and fro, the tailstock feed must also be manipulated to

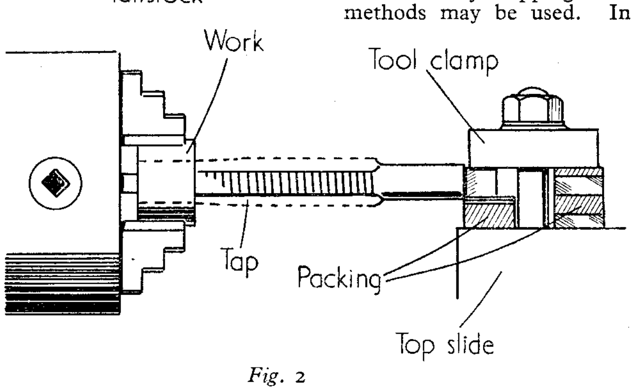


Fig. 2

maintain contact. This method is represented in Fig. 1.

In the second method, which is also applicable when a series of similar parts has to be threaded, the first component is threaded by the method just described, until the tap has taken a firm hold. The tailstock is then backed away leaving the tap in the work, and the lathe saddle is traversed to bring the shank of the tap under the tool clamp on the top-slide. The mandrel is now unlocked and packings are interposed between the squared portion of the tap shank and the slide as shown in Fig. 2. At the same time, an additional packing piece is fitted to keep the tool clamp level.

The packing under the tap must be carefully fitted, for the tap will cut oversize if thrown out of alignment by using either too much or too little packing. However, it will be found in practice that there is but little difficulty in adjusting the thickness of the packing to support the end of the tap at the correct height.

When this method of tapping is employed it is usually safer, until experience has been gained, to turn the lathe mandrel by hand so that the pressure applied can be felt directly and the lathe stopped instantly if trouble arises. If the back-gear is used and the tap happens to jam in the work, damage may be caused to the lathe parts.

Some workers are in the habit of turning the lathe mandrel for this and similar operations by pulling on the belt; but with the short V-belt drives now in common use this practice may lead to the fingers being pinched against the belt pulley. The easiest way, perhaps, to turn the lathe mandrel for heavy tapping operations is, as depicted in Fig. 3, to insert the chuck key and use it as a lever to rotate the work; this relieves the mandrel nose of driving strain and should in no way damage an ordinary chuck of robust construction. When tapping work held in the chuck, the temptation to over-tighten the jaws to prevent slip must be resisted, for this may easily cause serious damage, permanently affecting the chuck's capacity to hold work truly.

When threading a batch of parts in this way, and using an oversize tapping hole, it may be found that the tap enters readily and taps the hole to size without any to and fro motion being necessary; in these circumstances, the lathe back-gear may be used with advantage to save time and labour, and where the lathe drive is fitted with a reversing-switch, this can be usefully employed to back the tap out of the work.

A copious supply of cutting oil should be given to the tap when threading steel, and the tap

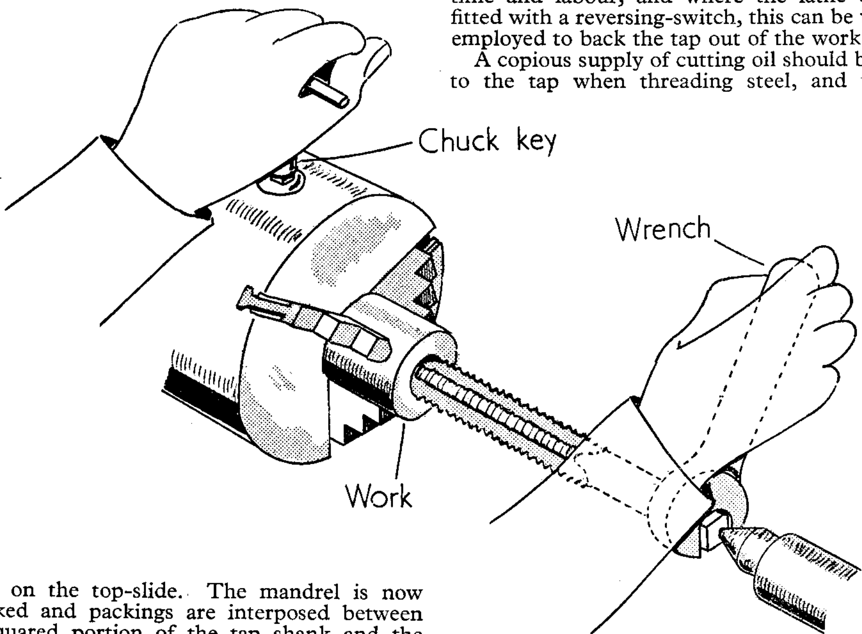


Fig. 3

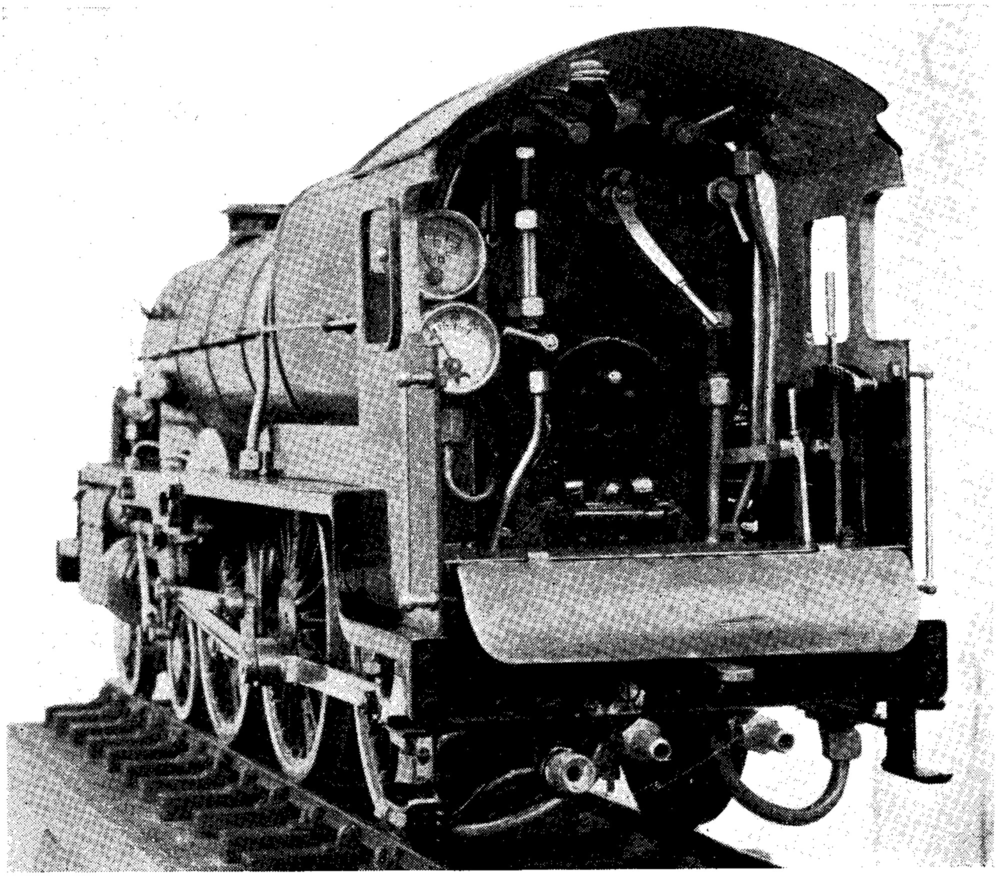
flutes can at the same time be cleared of chips with the oil brush.

Tapping blind holes in the lathe demands care, and where the mandrel or the tap is turned by hand the resistance felt when the tap reaches the bottom of the hole should be a sufficient warning to stop before any damage is done; but this does not apply when the lathe power drive is employed. To be on the safe side, it is better either to drill the tapping hole to an excessive depth, if practicable, or to remove the work from the lathe when the thread has nearly reached its full depth so that the tapping can be completed by hand in the bench vice.

Even when threads are screw-cut in the lathe, the threading methods described can often be employed with advantage to remove the last few thousandths of an inch of metal and so make the thread an exact nominal size and at the same time impart the correct root and crest to the finished thread. When the tap is properly guided in carrying out this operation, there will be no danger of making the tapped hole bell-mouthed, as may easily happen with hand tapping where the thickness of the material is insufficient to afford proper guidance.

*A Suggested British Compound Locomotive

by C. M. Keiller

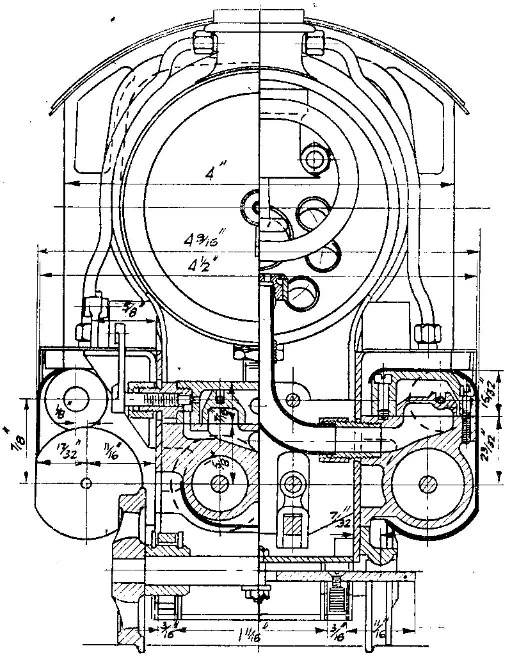


A view inside the cab, showing the various fittings

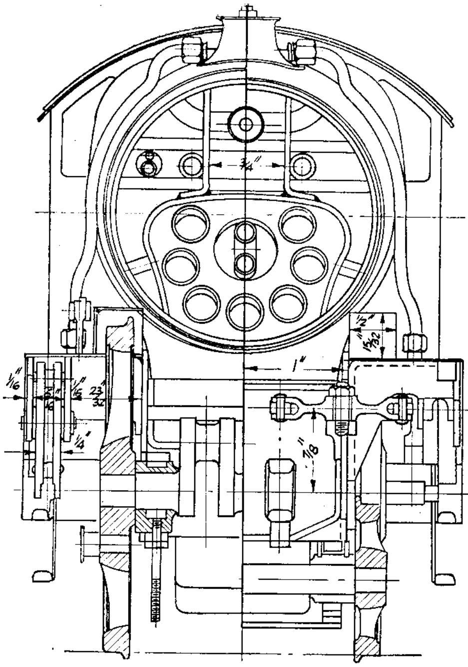
THE general construction is quite normal, but there is a good deal of refinement and detail, much of which is not seen. For instance, the cylinder blocks are not just lumps of metal with holes bored in them. All the axleboxes have oil-wells and pads, and plate springs are used on all axles except the crank-axle. The bogie is of the G.W.R. bar frame type with ball-bearing side pads. Actually, it was about the only type of bogie that would give the necessary clearance. All the frame stretchers are of steel plate.

*Continued from page 913, " M.E.," June 22, 1950.

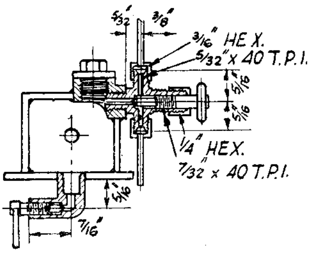
With an engine of this type one has to do a bit of scheming to get a nice simple arrangement of pipes, and I think I have achieved it. All the joints can be made steamtight with certainty and easily. The H.P. slide bars are below the piston-rods as on the Collin 4-6-2 " Nords," and this leaves a clear space above. An item that would probably not be acceptable in full size—but is well worth while in the model—is an under-shield stretching from the cylinders to the motion-plate. The H.P. valve spindle glands cannot be attended to without removing the boiler, but everything else can be easily got at. The motion looks light, but is all quite robust with large



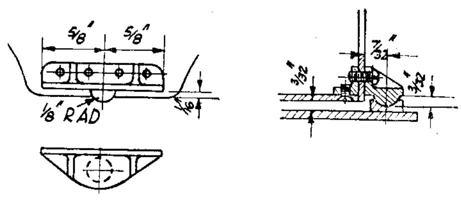
Cross section through cylinders



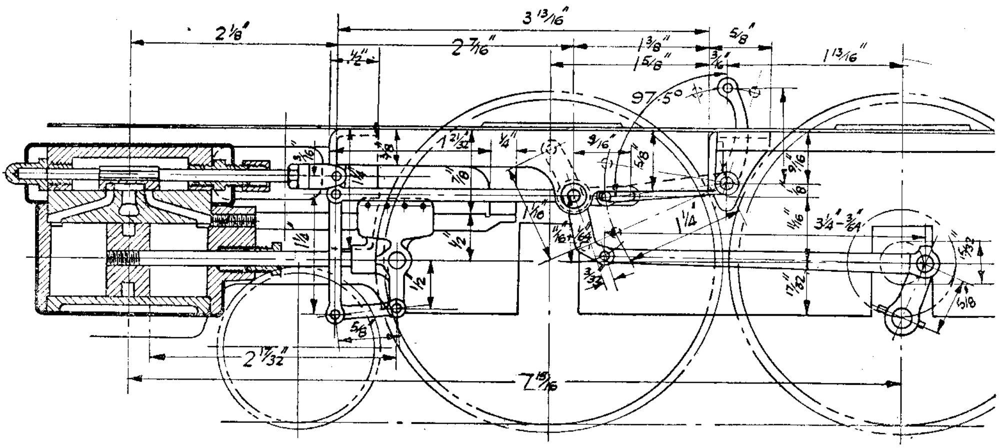
Cross section through crank axle



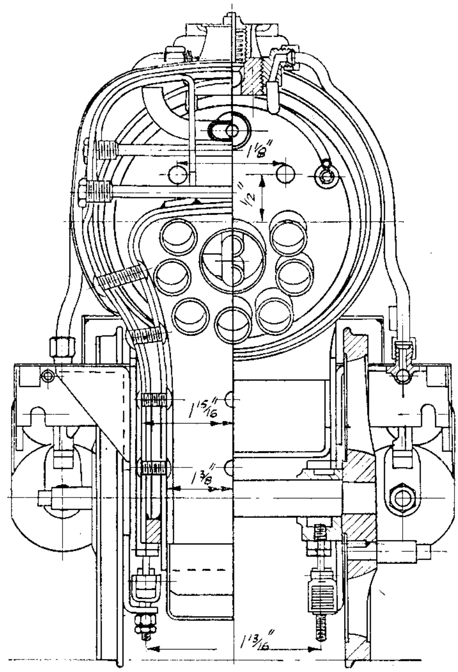
Details of the lubricator



Bogie suspension pads



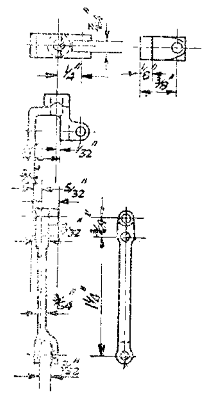
Arrangement of valve-gear



Cross section through firebox

bearings, the axle journals being 15/32 in. long and the big-ends ¼ in. long. All the axles are hollow, which of course is just a piece of swank! The starting valve is of the quick-thread type on the side of the H.P. steamchest, and passes steam to the H.P. exhaust pipe ; it is operated by the lever standing beside the reverse.

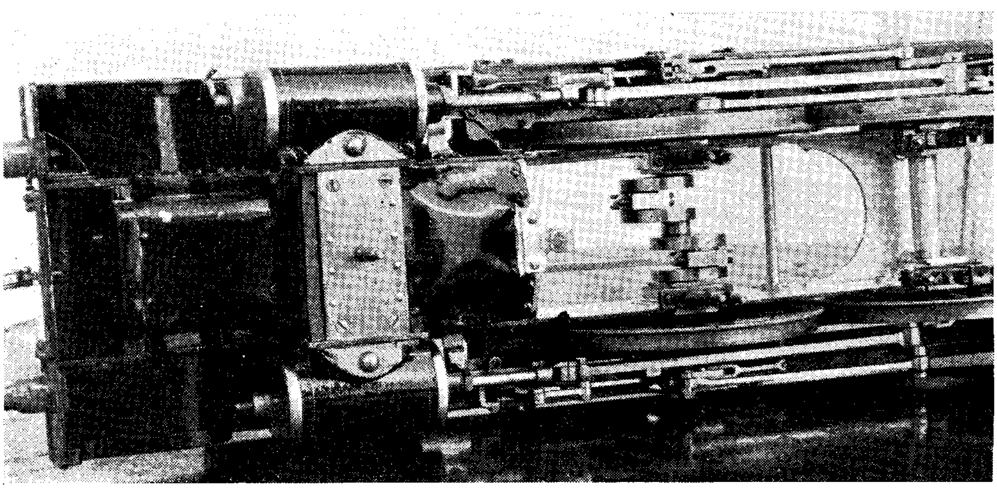
Former blocks which have been used several times before were used for flanging the boiler plates, so this one is very much like the boiler of my 2-8-0. The firebox is longer, the same scale length as in the G.W.R. "King," and the barrel shorter ; the grate is sloped the whole length, and was not too easy to keep burning over its whole length until certain adjustments were made. However, it is a very good steaming



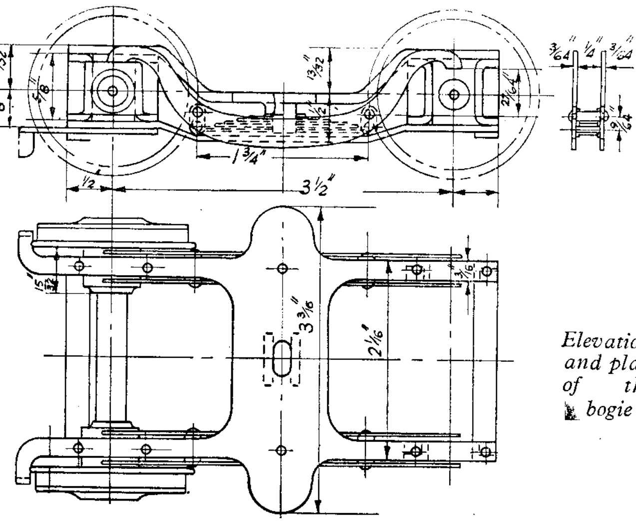
Valve-gear details

boiler, and will make steam against the injector while running. I have used multiple-element superheaters in the past, but this one has a single element. I think it is best for this size, provided the relative sizes of flue and element are right. The firebox side stays are screwed and riveted only, no other caulking. I had to make a special hammer to work inside the box, but on the whole, I think it entails less work than fitting nuts, and it is much more satisfactory.

The feed arrangements are two "80" injectors of my own design, and make deliveries through top feeds. Their two steam valves are symmetrically over the regulator. The small valve between them was for steam feed to the



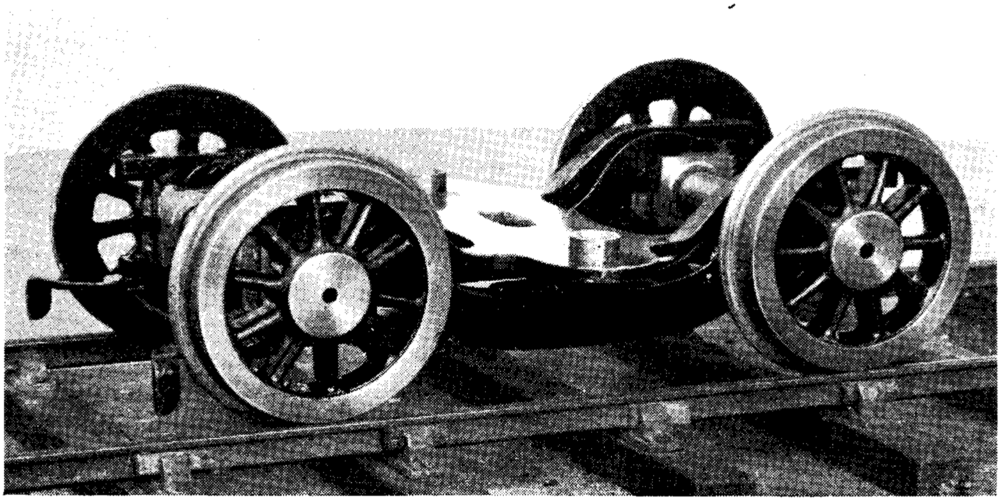
A view of the motion from underneath, undershield in place



Elevation and plan of the bogie

lubricator, but has now been cut out as it was difficult to control. The present steam feed is taken from the steam pipe, and oil is delivered lower down on the pipe, essentially the same as my other locomotives, except there is now an adjustable needle-valve instead of a fixed choke.

Like all compounds, there is the delay action in handling, which makes control a bit more tricky than with a simple, especially if there is much slipping. There is plenty of power, and so far I have not been able to give it more than half regulator on the first notch from mid gear. This notch is a fair distance from mid gear and gives 50 per cent. cut-off, roughly equivalent to 25 per cent. cut-off on a simple, and the receiver pressure is about 30 lb. I had thought that it should take full regulator on this cut-off, as my 2-8-0 with the same size cylinders as the L.P. takes full regulator on the 25 per cent. cut-off. Actually, I am not sure that a screw would not be better than a lever for a compound, when used on continuous running. My L.M.S. compound behaves very nicely with the regulator full open and controlled entirely by the screw ; it will take right up to mid-gear. Lever reverse does not really give a fine enough adjustment for this ; even with a large-radius quadrant, the steps are quite 10 per cent. to 15 per cent. for each notch, which means the difference between violent slip and not enough power to climb my bank. The regulator can give sufficient control, but it requires very minute movements.



The bogie

The Sheffield Exhibition, 1950

by W. J. Hughes

(Photographs by Press Photo Agency, Sheffield)

THOSE thousands who visited the above show were well rewarded, for many of them, as well as the judges, commented on the high quality of the craftsmanship displayed.

The Open Championship Cup was won by D. S. Anthes, M.B.E., of the Sheffield Ship Model Society, with his "s.s. *Beaconstreet* leaving Halifax, 1944." This model is to scale, 16 ft. to the inch, and the minute detail has to be seen to be appreciated. Doubtless many readers will recall seeing it at the 1949 "M.E." Exhibition, where it was awarded a Silver Medal. At our show it also won the Open Trophy of the Ship Model Society, and first prize in its class.

The President's Cup, open to members of the Sheffield S.M.E.E. alone, was awarded to A. B. Langley for his 15-c.c. *Seal* 4-cylinder petrol engine. As seen in Photograph No. 1, the engine is well finished, and was well displayed together with its accessories. It starts easily, ticks over beautifully, and runs quietly—the stub of copper pipe attached to the exhaust manifold is all the silencer that is required.

In the passenger-hauling locomotive class, S. E. Watson's Triplex Mallet locomotive caused great interest. To ½-in scale, it is nearly 5 ft. long, being a model of the biggest engine in the world, the famous 2-8-8-8-2 compound which has hauled a 16,000 ton mineral train 1½ miles long, (all wheels are fitted with compensated leaf springing, by the way). With her six hefty cylinders and her 24 driving-wheels, the performance of the small edition should be equally staggering, for 2½-in gauge, when she is finished!

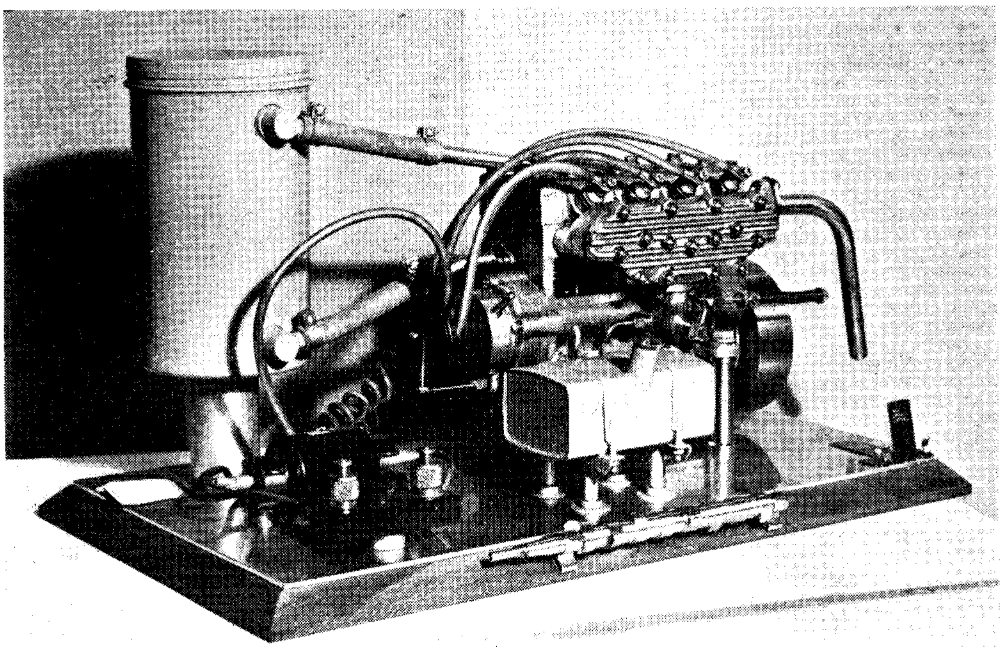


Photo No. 1. A 15-c.c. four-cylinder "Seal" engine built by A. B. Langley. The "spare" camshaft clipped to the front of the baseboard is actually one which refused to harden, so that a second had to be made

First prize in this section was awarded to W. Hibbert, of the Buxton Society, for his 0-6-0 L.M.S. tank to ¾-in. scale. I learned from Mr. Waterhouse, of the Wigan Society, on whose track she was first tested, that this engine steamed like a witch the first time she had a fire in her, and that there were no teething troubles at all. When painting is completed, this engine should *really* be "the real thing in miniature."

Another Buxton locomotive on show, by E. R. Morten, was the 10-mm. scale (gauge "1") L.M.S. Class "5" locomotive *Ayrshire Yeomanry*. This engine is steam-driven, and

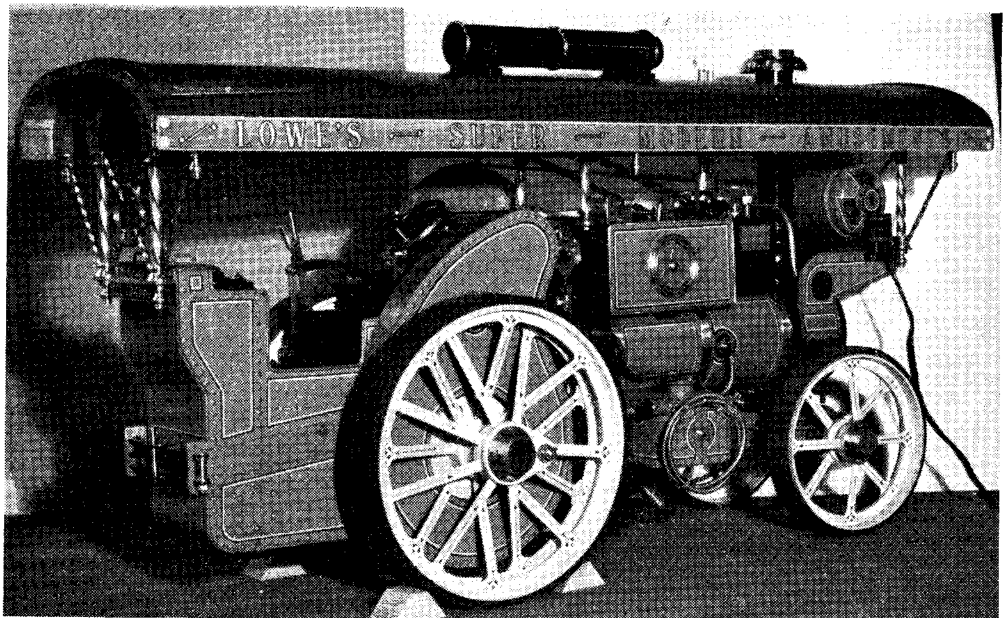


Photo No. 2. This fine $1\frac{1}{4}$-in. scale showman's road locomotive, by E. O. Lowe, of Rotherham, won the Championship Cup in 1949. Working under compressed air throughout this year's show, she had the authentic gentle "rock" of the prototype

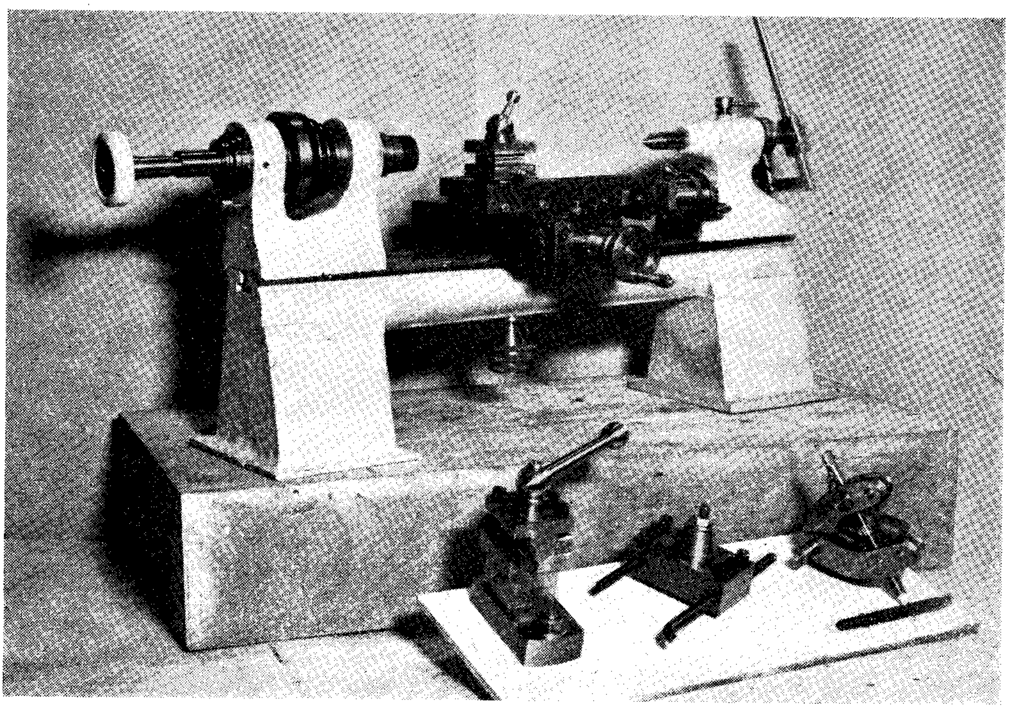


Photo No. 3. (Top) A $2\frac{5}{8}$-in. centre precision lathe by W. A. Milnes—a fine piece of work. (Bottom) Rear toolpost for M.L.7 lathe by W. J. Hughes, with parting-off, boring and (unfinished) knurling attachments

fired by either spirit or paraffin; the detail and finish are superb, and again a first prize was awarded. I venture to state that if the engine were photographed against a "scale" background, it would be difficult for the greatest expert to say "real" or "model."

When P. Thompson's *Dunalastair III* (Caledonian Railway), 4-4-0 locomotive is finished, it should be a worthy contender for a high award, and so will J. H. Hatherley's 0-6-2 M.S. & L. locomotive, which was runner-up for the President's Cup. The 8-wheeled tender of the "Caley" engine has a compensated brake gear.

An Historical Model

We were privileged to exhibit a fine model of a "self-moving agricultural engine" which was built in the years 1893-7 by the late Capt. T. J. Tresidder, R.E., C.M.G., a model which aroused much interest partly because of its age, partly because it differed widely from the usual traction-engine, and partly because of the beautiful finish. Although built in the 90's, the "period" of the model was the 60's, with its double high-pressure cylinders over the firebox, its chain drive, and other features. But I must not anticipate too much, for it is proposed to describe and illustrate this engine fully in a subsequent issue.

Photograph No. 2 shows E. O. Lowe's $1\frac{1}{4}$-in. scale Showman's Engine, which was on loan this year, working from a compressed air bottle beneath the stand. With rods flashing and eccentrics tumbling under the electrically-lit canopy, she gave rise to many admiring comments—and so did the Beam Engine which R. A. Barker described recently in THE MODEL ENGINEER; it also was working under compressed air on a separate stand.

Incidentally, we find that this is a good method of spreading the crowds—namely, to put working models on stands in different parts of the hall, so as to form several centres of attraction, instead of having them all on the same stand.

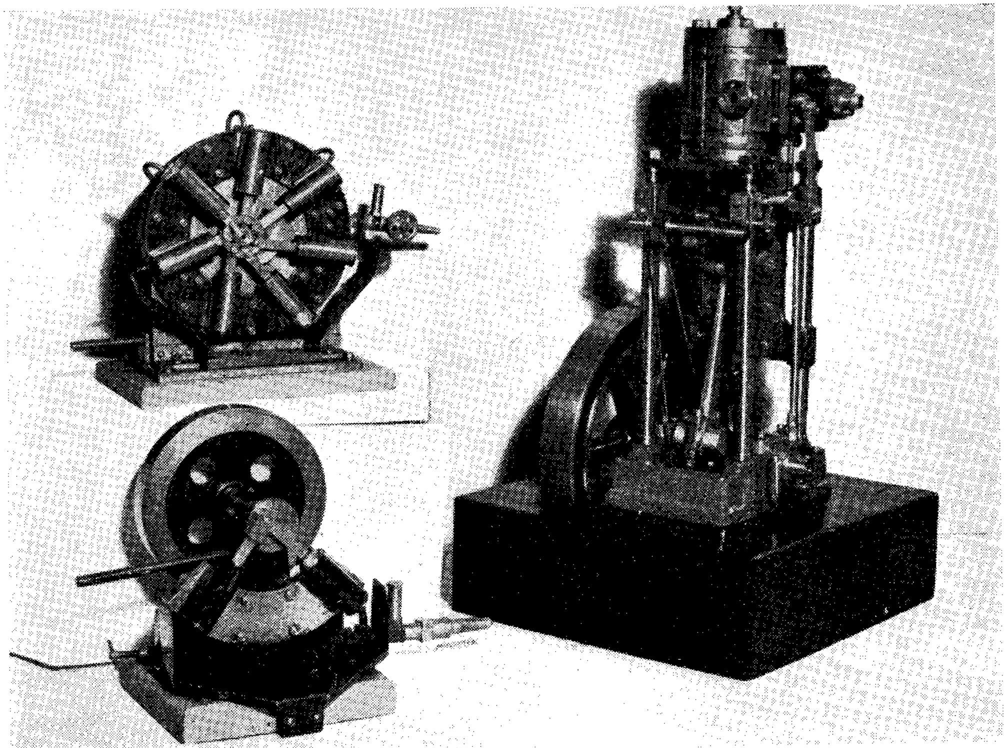


Photo No. 4. (Top left.) Seven-cylinder radial oscillating-engine. The top connecting-rod is the "master," the others working on it. This model is most fascinating to watch in motion: it was built by the late Arthur Skinner. (Bottom left.) Two-cylinder oscillating engine by Mr. Skinner. Both these models have run countless hours at many exhibitions. (Right.) Single-cylinder marine engine built by W. R. G. Thompson in 1910. Reconditioned and governors fitted by P. Thompson in 1938

A Practical Demonstration

Many members had a practical demonstration of the efficiency of the 9.5-mm. cine projector by K. Walton, for he ran a "Popeye" film through prior to the show opening. Even in daylight the results were good, and I hope that Mr. Walton will fulfil his half-promise to describe the machine for THE MODEL ENGINEER readers. Another of Mr. Walton's machines

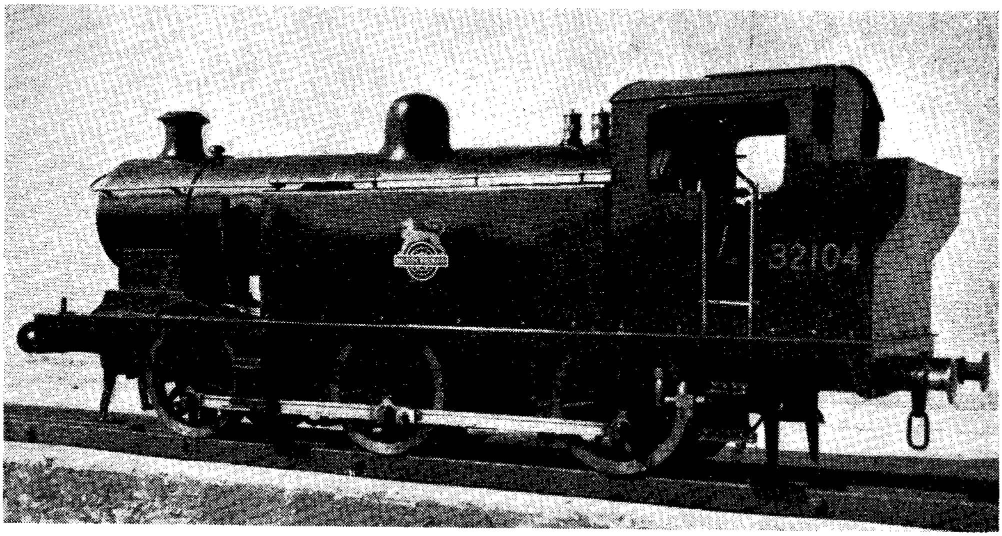
(*Continued on page* 952)

"MINX" – TAIL = "MANX"

by "L.B.S.C."

HERE is a sample of the kind of " originality " that is a pleasure to see or chronicle ; a vastly different proposition than tinkering about with a valve-gear or other vital parts of a locomotive, in an effort to " be different " ! Some time ago, Mr. L. J. Markwick, hon. secretary of the East Sussex Locomotive Club (nothing " toy-shoppy " about *that* title !) decided that he would like a simple but powerful tank engine in 5-in. gauge to run at fetes and similar functions. The requirements were, simplicity, power, reliability, ease of building, and a locomotive that could be built in the shortest possible time at a reasonable cost. Being rather partial to the old L.B. & S.C. Rly. he took a fancy to the *Minx*, the 5-in. gauge tender engine of 0-6-0 type that I recently described in detail, in these notes ; he dispensed with the tender, and as she was then like the cats from the island famous for its kippers and its three-legged " trademark," called her the *Manx*. He then got busy to such good purpose, that in a total of 580 working hours, the engine was completed. Some job, that !

There is no need to describe the job fully, as the locomotive is built " spot on " to the *Minx* instructions, except for detail necessary for the conversion to a tank engine. She has Joy valve-gear, and steam brakes as specified. The boiler barrel is $\frac{3}{4}$ in. shorter, to " work in " a piece of tube that Mr. Markwick had in stock. The whole of the brazing was done with a five-pint blowlamp, using C-4 alloy, and Easyflo ; the only trouble was a couple of pinholes, and when these were attended to, the boiler was tested to 200 lb. and proved as tight as a bottle. Our friend specially mentions the crank axle, which was made exactly as described, press-fitted after heating the webs, so that the joints were " shrunk-fit " on cooling ; he says it hasn't shifted yet, and isn't likely to !



Note the L.B. & S.C.R. details—and the hungry lion !

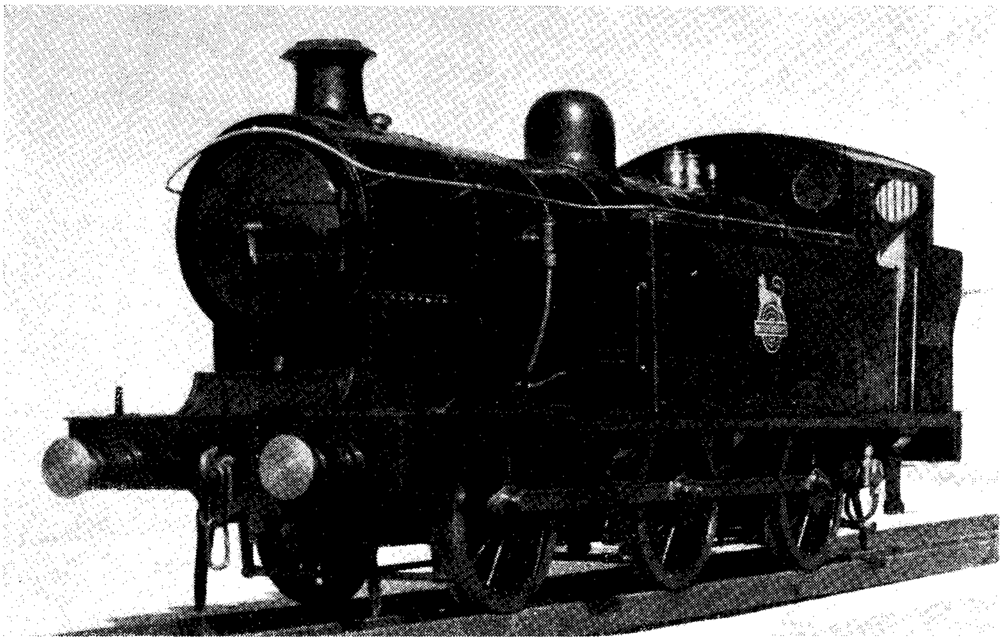
On the track, she proved a " first-timer," taking hardly any notice of a load of five adults and two children, all that the available passenger stock would carry. The boiler steams like a witch, on the pin all the time with the pump at work. Even with the bypass partly open, the water creeps up the gauge glass. Our friend says that certain good folk who decry the Joy valve-gear, should hear her even beats ; and she will notch right up next to middle. He also says that the " Brighton " influence can be detected in his arrangement of the upper works ; it certainly can, as I should put her down as a cousin to the last lot of 0-6-0 tanks designed by Lawson Billinton. She bears one of their numbers, anyway, although she has " joined the combine," as witness the L.N.E.R. snifting valve and the L.M.S. safety valves. Incidentally, I spoke out of my turn when mentioning that I hadn't seen a picture of a little engine bearing the sign of the hungry lion ; here he is, all-present-and-correct-sergeant. Congratulations to " Bro. Secretary " on a sound and workmanlike job ; anybody who wants a six-coupled 5-in. gauge tank engine with everything on it that matters, and nothing that doesn't, might do worse than

follow his good example. I nearly forgot to mention that Kennion Bros. supplied the castings for the cylinders, and A. J. Reeves the rest of the castings and materials ; credit where due !

"Pamela" (Contd.) Exhaust Pipe Assembly

By the good rights, I should describe the valve-gear directly after the cylinders, guide-bars, crossheads and connecting-rods, as I like to maintain the proper sequence of operations, to make the job as easy as possible. However, I propose to make a slight "detour" here, for the following reason. I take it that builders of *Pamela* want to get the engine on the road as quickly as possible, and not leave it for their great-grandchildren to finish ; therefore, having just described the mechanical lubricator for *Tich*, in full detail, I thought we might use those instructions for this job as well, as the lubricator is made in exactly the same way, though it differs slightly in dimensions, having a bigger bore and stroke, and a larger oil tank. This will save repeating a lot of rigmarole. Also, whilst on the job, we might as well fix the exhaust pipes, and get that bit out of the way ; so here is the needful, in the way of drawings, plus a few brief notes.

The exhaust pipes and blast pipe are made on the same principle as described for *Doris*, giving a "streamlined" exit for the spent steam. There is one little difference ; whereas *Doris's* chimney was exactly over the centre-line of the cylinders, *Pamela's* isn't, being set with its centre-line $\frac{7}{8}$ in. behind that point. This variation doesn't make the job any more difficult ; all you have to do, is to incline the curved pipes to an angle of 45 deg., and bend the bottom of the blastpipe to suit. The exact angles don't matter, as long as the blastpipe nozzle lines up with the centre-line of the chimney, and is approximately $1\frac{1}{2}$ in. above the frame.

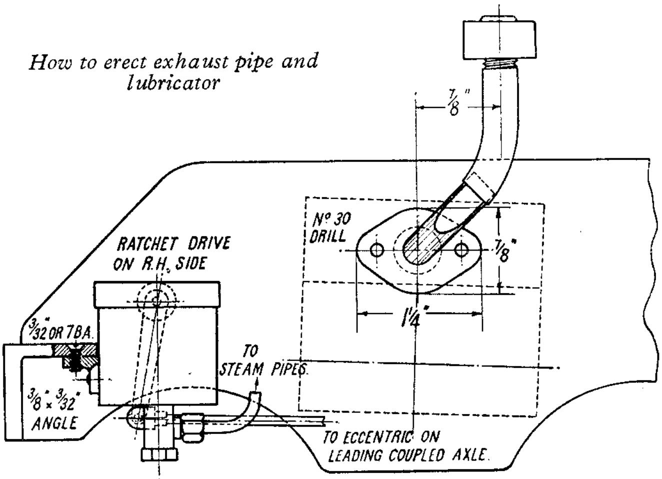


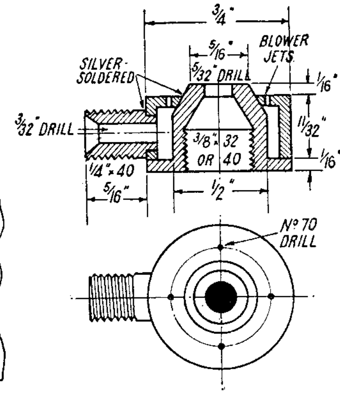
Tank-engine edition of "Minx," by Mr. L. G. Markwick

Cut the flanges from $\frac{1}{8}$ in. sheet brass, to the dimensions given ; maybe our approved advertisers could supply cast flanges, which might be a little thicker, and they could be tapped for the screws, instead of using nuts. Beginners should not forget that the pipes are easily bent if annealed first ; and the bend should be made near the end of a long piece of pipe (when I say "long," I don't mean as long as Merstham Tunnel, but merely long enough to give sufficient leverage for easy bending), and the bent bit is then cut off. File the two bits carefully, so that they make a nice butt-joint when the blast-pipe is pressed over them. They should also be a tight fit in the flanges. The blast-pipe will need a bit of $\frac{3}{8}$-in. tube about $1\frac{5}{8}$ in. long ; leave it straight at first, then silver-solder all the joints at one heat—Easyflo, or finest grade silver-solder, is the stuff for this job—then bend to the required amount to bring the top of the blast-pipe $\frac{7}{8}$ in. behind the centre-line of the cylinders. Screw the end for the blast-pipe nozzle $\frac{3}{8}$ in. $\times$ 40 if you have that pitch ; if not, use the finest you have. It wouldn't be a bad wheeze to tap the end of a foot or so of larger pipe with the same thread, screw it on to the top of the blast-pipe, and use it as a lever for bending the assembly to the required angle. I very often do things like that ; of course, it's "all wrong," but somehow it seems to do the trick all right. Curious, isn't it ?

The holes for the flange screws are drilled No. 30, at $\frac{7}{16}$ in. each side of the centre of the exhaust hole in the frames. After setting the assembly in place, either use the No. 30 drill and go clean through the flanges, securing with countersunk screws and nuts, or else make countersinks on the flanges, drill No. 40, and tap $\frac{1}{8}$ in. or 5 B.A. screwing direct instead of nutting. If frames and flanges are truly faced, a smear of plumbers' jointing over the flanges will prevent any steam blowing out, and there is only exhaust pressure to contend with. That isn't much on engines of your humble servant's design, as most folk know.

How to erect exhaust pipe and lubricator

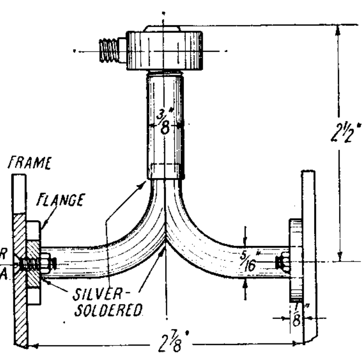




Combined blast and blower nozzle

Combination Blast Nozzle

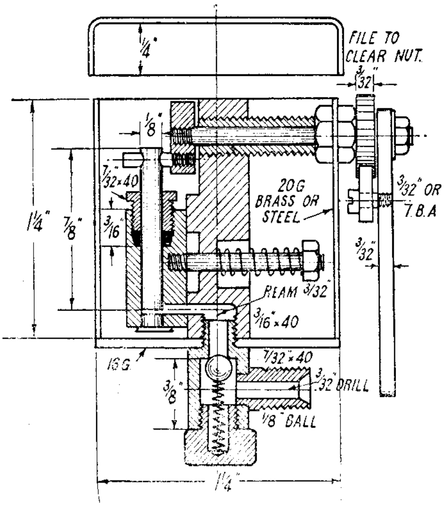
The blast-pipe nozzle differs slightly from that described for *Doris*, in order to get the blower holes closer to the centre-line of the chimney. The middle section is made just the same, but is only $\frac{3}{4}$ in. overall diameter. The cup is turned and bored, same as for *Doris*, but is only $\frac{3}{4}$ in. diameter outside, and $\frac{5}{8}$ in. inside. Instead of drilling a $\frac{1}{2}$-in. hole in it, drill it 11/32 in., and then ream it until it touches the coned part of the nozzle, and the flange at the bottom, at the same time. Fit the nipple in the side of the cup, as shown, and then silver-solder the whole issue, as previously described. The four blower-jet holes are then set out on a $\frac{1}{2}$-in. circle, and drilled with a No. 70 drill. A mere breath of steam through these, will keep *Pamela's* fire brisk and sparkling, whilst she is standing. The roaring blower so frequently in evidence on club and exhibition tracks, is not needed on the locomotives described in these notes.



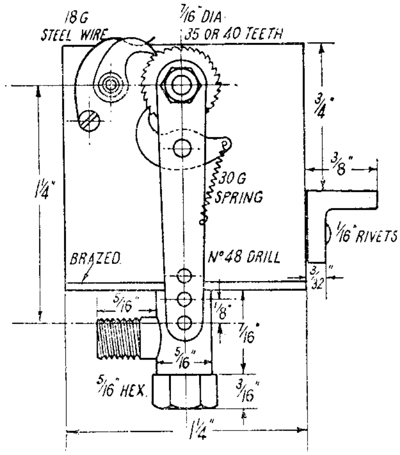
Exhaust pipe assembly

Several of my own locomotives now have the above type of combination nozzle, and here is an example of their effectiveness. On a recent Saturday afternoon, a couple of my few personal friends came up from Ashford, and the first engine to be put in steam was my old $3\frac{1}{2}$-in. gauge L.N.W.R. 4-4-2 tank engine *Olga*. I took first crack at the regulator, to see if the line was all right after alternate rain and sunshine, and after running a distance equivalent to that from Euston to Watford, pulled up to hand her over to the first relief driver. I usually run with the firehole door open, to prevent excessive blowing off, and the "clock" indicated 70 lb. when I stopped, put the blower on a little, and started the injector to keep her quiet. Although there was only a faint hum from the chimney, and the chirrup of the injector could only just be heard, she started to blow-off before "No. 1 relief" had settled himself on the flat car and was all set to go, with a trailer car and passenger. When running, the beats are quiet but exceedingly sharp, the comparatively long taper and short parallel part giving bags of draught without causing back pressure. With a normal fire, the steam gauge pointer stays where it belongs, when running with the injector working; and the boiler will blow-off furiously directly steam is shut off, unless the firehole door is opened.

Talking about boilers, maybe you good folk who are reading this, would care to share a laugh with old Curly. I recently received a letter from a new American reader, who informed me that he had carefully studied my boiler designs, and had come to the conclusion that they were all



Section of lubricator



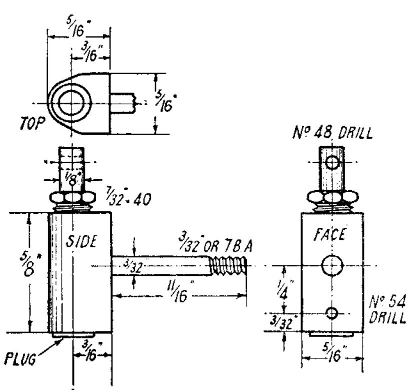
Ratchet gear

wrong ; tube arrangements, heating surface, all out of proportion, not enough grate area, and so on and so forth. They could never hope to steam continuously under any condition. His qualifications ? Well, I hardly need state them ; the principal one was, *that he had never built a small locomotive boiler in his life* ! I know of more than one club member who has altered one of my boiler designs to suit his own pet theories, and been mighty sorry for it. A nod is as good as a wink to a blind horse ; 'nuff sed !

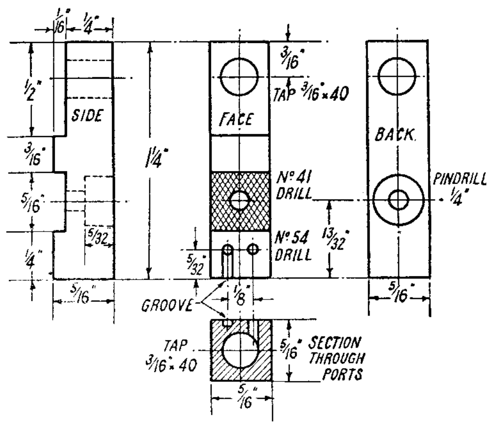
Mechanical Lubricator

As stated above, all you have to do, to build a mechanical lubricator for *Pamela*, is to follow the instructions given for *Tich*, and work to the sizes given in the accompanying illustrations. Here are the small differences to which attention should be paid. The oil tank is a wee bit bigger, being 1¼ in. square. When making it, instead of the bent strip specified for *Tich*, for attachment to the buffer-beam, rivet a 1¼-in. length of ⅜-in. × 3/32-in. brass angle to the front, at ¾ in. from the top. Beginners note, the easy way to do this is to tack the angle in place with a little soft solder ; then rivet up, and heat the lot to the melting point of the solder, applying a little liquid flux (not paste) so that the solder sweats into the joint and seals the rivets. No filling-plug is needed in the lid, as it comes above the buffer-beam.

The pump cylinder is drilled No. 34 and reamed ⅛ in., and the gland is 7/32 in. × 40. The ram is made from a ⅞ in. length of ground rustless steel, or hard-drawn phosphor-bronze ; it needs no separate big-end, as the No. 48 hole for the crankpin is drilled straight through it, as shown. The stroke is ¼ in. Leave the ram overlong at first, then drill the crankpin hole, and try it in the pump after assembly. It will

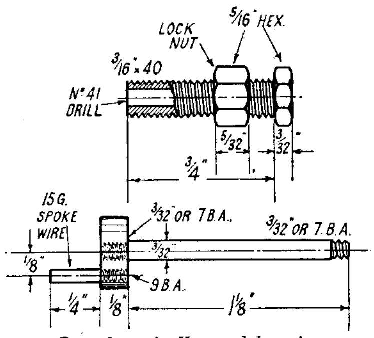


Oil pump cylinder



Stand for oil pump

probably bottom on the plug at the end of the bore. Reduce a weeny bit at the time, taking off a skim in the three-jaw, until the end of the ram clears the plug by 1/64 in. when the crankpin is in its lowest position; that will give the pump practically 100 per cent. efficiency. Don't forget, when erecting the stand and screwing in the check-valve underneath, that the union screw on the check-valve should point toward the back of the engine, opposite to the angle-bracket on the oil tank.



Crank, spindle and bearing

The angle is attached to the underside of the buffer beam by three 3/32-in. or 7-B.A. countersunk screws as shown. Machine up a strap for the eccentric already fixed to the leading axle, exactly as described for the feed pump eccentric; but instead of a flat rod, screw a round one into the lug, made from ⅛-in. silver-steel. The leading end of this carries a little fork which embraces the ratchet lever, and is attached to it by a 9-B.A. screw with a plain part under the head. The exact length of the eccentric-rod is best obtained from the actual job, as described for previous engines in these notes. The ratchet should click one tooth per revolution of the coupled wheels.

The Sheffield Exhibition

(*Continued from page* 947)

was an electric generator which, driven by W. G. Wilkinson's portable engine (described recently), helped to light up the stand on which several working models were placed.

An unusual and attractive model was a trailer caravan, one-sixth of full-size, built by L. J. Robinson. Fully fitted-out with sink, gas-cooker, and electric light, further realism was added by such details as a loaf partly cut up in the galley, a plate of boiled ham and salad, and a dish of fancy cakes! Besides winning a first prize, this model was a runner-up for the Championship Cup.

For the second year in succession the Harwood Prize for Juniors was won by J. B. Clegg, aged 16, who this year exhibited a very nice "O"-gauge L.N.E.R. Class "B1" locomotive with two coaches. This exhibit also won the Novice's Prize (a set of "Dot" castings kindly presented by W. K. Waugh of Glasgow), and a micrometer presented by the president of the society, Mr. W. T. Kitching. Nor should I omit to mention this young man's 4-mm. scale Burrell Showman's Road Locomotive, which at a glance quite recognisably was a Burrell "scenic type," though but a few inches long. If Clegg retains his present modest outlook, he should do very well as his craftsmanship matures.

The members of the Sheffield Ship Model Society always put on a superb show for us, with exquisite workmanship and competent technique. So, too, the Sheffield Model Yacht Club, whose boats are much admired, and the Sheffield Society of Aeromodellers, whose aircraft form a ceiling which one "looks up to" in two meanings of the phrase! Most certainly the exhibition would not be the same without the fraternal aid of these three societies, which we hereby cheerfully acknowledge. Thanks are due also to our neighbours of Chesterfield and Buxton, as well as to the lone-hands who sent models; to the judges (Messrs. L. H. Sparey and W. Young, and "Jason"); to the British Oxygen Company for supply of compressed air cylinders; and to the Needham Engineering Company for loan of a Laycock air-compressor.

For the Bookshelf

Engineering Precision Measurements, by A. W. Judge, A.R.C.S., D.I.C., Wh.C., A.M.I.Mech.E., A.F.R.Ae.S. Chapman & Hall, price 30s. net.

This excellent book, in its second (revised) edition, is a veritable encyclopaedia of scientific measuring instruments, and covers the field as no other volume has succeeded in doing in the past.

There can be no doubt that the author possesses an exceptionally vast knowledge and experience of toolroom and workshop practise, all of which has gone into the production of this truly excellent treatise. The scope is admirably wide and ranges from workshop scales, micrometers and gauges of all types, to the increasingly more intricate instruments for checking and measuring screw-threads and angles, with further chapters on comparators an other optical methods and special appliances. This second edition also contains an abridged account of the more important recent advances in which special reference has been made to measuring machines, projectors, micrometers, new types of slip gauges, thread gauges and internal measurement methods.

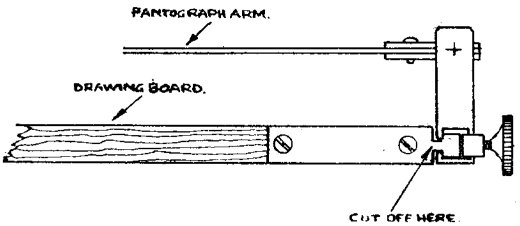
Further information includes gear testing appliances, interferometer applications in gauge testing, the Dekkor optical device and an account of the electronic comparator for high precision measurements.

The book is profusely illustrated by diagrams and photographic reproductions, and should appeal to all interested in precision work and the inspection thereof.

A Draughting Machine from an R.A.F. Chart Board

by R.H.C.

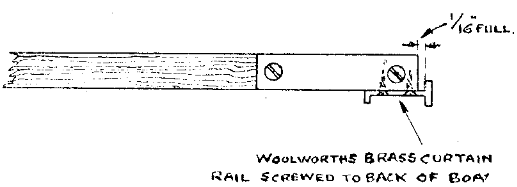
CHART boards, which are sold by an advertiser in THE MODEL ENGINEER for 12s. 6d., represent very good value for money, and are capable of easy conversion to small draughting machines. On the whole they are extremely well made; the only weakness seems to be the groove for the sliding clamp for the pantograph arm. This is formed in the edge of the board, and in the case of the one I bought, there was only a thickness of a bare 3/32 in. of wood left in the bottom of the groove, and as the groove runs with the grain of the wood for most of its length it very soon cracked in use.



Side view of board and sliding clamp before alteration

I do not know if all these boards were constructed on this principle, but if so one can imagine they had a short life under service conditions.

I got over the difficulty by cutting away the grooved portion of the board completely, and screwing a length of Woolworth's brass curtain-rail to the back of the board with small countersunk, brass wood-screws; this makes a very solid job. The fact that the curtain-rail does not come central over the top of the board does not matter, as the pantograph arm was originally slightly bent in order to make the protractor lie flat on the board, and the arm is now parallel to the surface.



Side view of board after cutting away original slideway and fitting curtain rail

As supplied, there is a single Perspex scale, which presumably is divided for some map scale, fitted to the underside of the protractor. This was discarded and circular plate cut from $\frac{1}{16}$ in. hard brass sheet with two lugs for attachment of the new scales which were fitted. These were purchased from one of W. H. Smith's shops, and are black with white divisions which match the protractor and look quite well. The brass parts were polished and given a coat of clear cellulose lacquer.

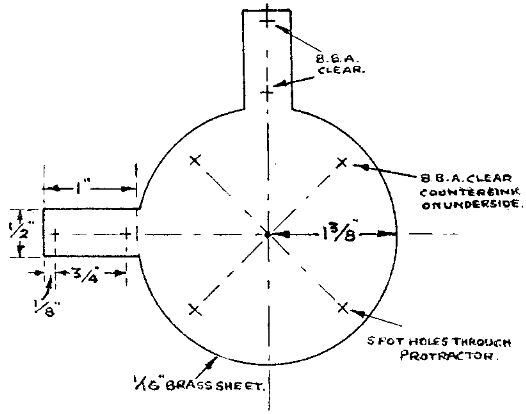
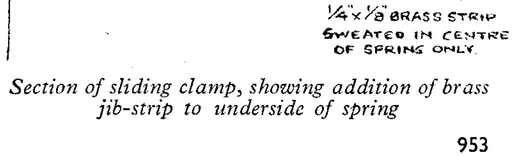


Plate for attachment of scales to underside of protractor

In use the paper is fixed to the board by means of a Bulldog clip. I find it most convenient to work with the pantograph arm clamped to the top right-hand corner of the board, but this is a matter of choice.



Section of sliding clamp, showing addition of brass jib-strip to underside of spring

The Car Colour Question

by C. Posthumus

A SHORT while back I was shown an "impressionist" model of Villoresi's "San Remo" type 4CLT/48 Maserati—the car which won the 1948 British Grand Prix at Silverstone. The chap who made it had got that slinky "Maser" line nicely, he'd made wire wheels for it, it had the correct number "18" on nose and flanks, and altogether it was a good first effort; but what do you think? He'd painted it silver instead of rich "Post Office" Maserati red! Remonstrations at this grave indiscretion brought forth the surprising confession that my friend had no idea Maseratis were usually red. From the photographs he used for guidance (taken, I suppose, in bright sunlight) the car, he said, looked silvery, so without more ado he painted it that colour.

Well, ignorance in such matters is no crime; I wouldn't know what colours Huddersfield or the "Spurs" wear on the football pitch, and feel no deep shame about it, but as I believe other cases of miscolouring of car models are often due to lack of information on the subject, I feel it may be worthwhile, in the all-important cause of realism, to record some details of the various colours used in international motor racing.

To do this simply, I have drawn up the accompanying chart of recognised national colours, but it must be noted that the use of these is not obligatory in all racing events, and many race organisers do not enforce it. Even so, all the Continental teams and most "independents" drive under their national colours, but some drivers—the majority of them from this country—understandably like to indulge their ego a little, and paint their cars in the colours they fancy. Thus we have, in past years, seen E.R.As in all shades of green, blue, grey, red, black and white; "works" Austins from 1934 to 1935 in white; T.T. Rileys in blue; M.Gs in all the colours of the rainbow, and a much earlier instance, a Sunbeam T.T. team, that of 1914, painted in purple! Such individual tastes, while enhancing the already colourful racing scene, could lead at times to confusion and inconvenience. Unknowledgeable spectators abroad, on seeing a blue British car, might excusably think it French, or if red, Italian, and thus credit for a good British performance can be lost—the red Frazer-Nash, which did well at Le Mans last year being an example, many spectators imagining it came from Italy. In the Grand Prix of the Nations at Geneva, the biggest G.P. race of 1946, many

INTERNATIONAL RACING COLOURS

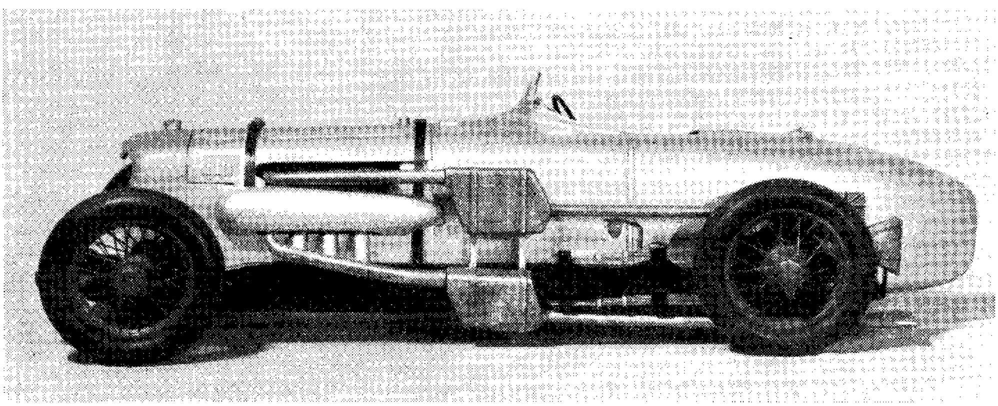
GT. BRITAIN	FRANCE	ITALY	GERMANY	SWITZERLAND
Green Napier Sunbeam Bentley E.R.A. Austin Alta, BRM and independently-owned Maseratis, Alfa Romeos, etc.	**Blue** Peugeot Ballot Delage Bugatti Talbot Delahaye Simca, and independently-owned Maseratis, Alfa Romeos etc.	**Red** Fiat Alfa Romeo Maserati Ferrari *Cisitalia, etc. *Several privately-owned Cisitalias are raced in other colours	**White** *Mercedes-Benz *Auto-Union B.M.W. Veritas *Silver from 1934-1939	***Red and White** Independently-owned Maseratis (E. de Graffenried, Mandirola, Hug etc.) *Red with white bonnet
SIAM	U.S.A.	BELGIUM	HOLLAND	ARGENTINE
***Blue and Yellow** Independently-owned Maseratis and E.R.A.'s (B. Bira) *Blue upper portions, yellow chassis line and wheels.	***Blue and White** Early Duesenbergs, Millers, and Whitney Straight's independently-owned Maseratis. *White upper portions, blue chassis.	**Yellow** Independently-owned Talbot, Veritas, etc., (J. Claes, E. Cornet, etc.)	**Orange** Independently-owned M.G.'s, (Hertsberger, Herkuleyns) Cooper (Beels)	***Blue and Yellow** Independently-owned Maseratis, and Ferraris (J. M. Fangio, Campos, and Gonzalez) *Blue with yellow bonnet.

British runners had to re-spray their cars to comply with the regulations and one, Reg. Parnell, did the job before racing at Albi a week before, spraying his red Maserati in the street before an intrigued crowd of Frenchmen!

The true British racing colour is a mid-green hue, known as Napier green, first used on Edge's Gordon Bennett-winning car and worn honourably since then, with slight shade variations, by many G.P. Sunbeams, and the famous Le Mans Bentleys. The first "works" E.R.As were finished in a beautiful pale shade, but this, regrettably, was changed to black in 1936, then reverted to a different shade of green in 1938. France's blue varies with the marque too, and the current $4\frac{1}{2}$-litre Lago Talbots are painted in a pleasant light blue, as were the famous old G.P. Delages. The classic Bugatti was invariably finished in a unique and exquisite shade, halfway between pale and mid-blue, almost, indeed, an electric blue, which set off the beautifully polished chassis parts admirably. The reds of Italy also vary with the make, while the bearers of Germany's "white," the Mercedes-Benz and Auto-Union teams which dominated G.P. racing from 1934 to 1939, were actually finished in silver, and you will certainly not find examples of these cars in any other colour. Nor, I would stress—since all this began over a Maserati—will you find a 4CLT/48 "San Remo" Maserati in silver, unless one day an English owner should feel the need for a change—or some German driver acquires one and races it under his colours—which may soon be possible as the ban on German competitors is being lifted.

Correct colouring of a model car, whether "powered" or "static," is just as important as correct proportioning, correct size wheels, etc. No ship modeller would paint his *Queen Mary* in green and orange; no painstaking locomotive modeller would finish, say, a G.W.R. "Cheltenham Flyer" in L.M.S. maroon ... To err likewise in car modelling is to sabotage that most important of factors in model engineering, realism. If you are in any doubts at all about the correct colouring of your model, do not hesitate to consult THE MODEL ENGINEER staff who are ever ready to help in such matters.

A Model of an Historic Racing Car



IN 1933, when John Cobb's great Napier-Railton racing car was being built at Brooklands, Mr. Gebby, of Weybridge, made a $\frac{1}{8}$th scale model to show the outstanding features of the chassis. Nearly 2 ft. long, this model faithfully reproduced the underslung side-members, the double full-cantilever rear springing, the installation of the Napier Lion aero-engine with which the real car was to be powered and other features. Dunlop made special model track tyres for it and Mr. Gebby made the wheel spokes from pins.

Cobb's car duly made its appearance, broke many records and won many races. It eventually left the Brooklands lap record at 143.44 m.p.h. But the model disappeared.

A short time ago, Derek Dent, well-known a quarter of a century ago for his large scale model Frazer-Nashes, found it and persuaded C. Posthumus to put on an authentic body and exhaust system, etc. The work has been completed and Dent is the owner of a very accurate model of this famous car, in a rather unusual scale. As the real Napier-Railton is in the hands of a film company and its fate unknown, it is particularly pleasing that this historic model is in safe keeping.—W.B.

IN THE WORKSHOP

by "Duplex"

66—Pipe Fittings

PIPE fittings are but few in form and comprise, for the most part, unions, taps and special fittings such as elbows and tees to enable the pipe work to be arranged neatly, and reducing sockets to allow two pipes of different diameter to be joined together.

Unions are, probably, the most important of all the fittings, for without them the attachment of pipe work could only be effected either by soldering or brazing, or by screwing directly into the machine; but where unions are fitted assembly as well as dismantling can be readily undertaken. Much thought has been given to the design of these fittings, as is shown by the many varieties now on the market, and the whole trend of design has been to do away with the need for either soldering or brazing. In Figs. 1 to 6, the various forms of unions in common use are illustrated.

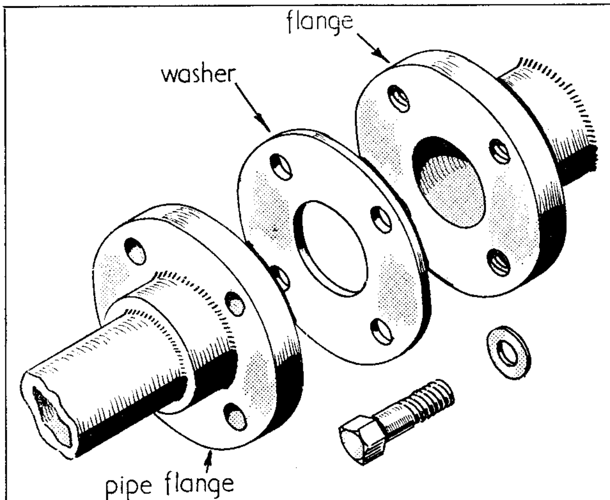


Fig. 1. Flange joint

In Fig. 1 will be seen the flanged type of union which is often used not only for connecting pipes to boilers, air receivers and the like, but also for making joints in the run of the pipe itself. The arrangement has the merit of great mechanical strength and is thus much used for high-pressure work. The provision of a number of fixing bolts allows the fitter to bring considerable pressure to bear and to ensure that the joint flanges are pulled down evenly.

A variation of this form of union, for use on small pipes, is shown in Fig. 2. Here the joint is made between a flanged union nipple and a corresponding flat seating; a washer made from red fibre, or other stong but compressible material, is interposed to form a seal; turning the union nut then serves to pull the joint firmly together. This type of union was, at one time, much used in automobile work, but, no doubt, owing to the repeated loss of fibre washers during dismantling and reassembly, it was largely superseded by the form shown in Fig. 3, where it will be observed that no washer of any kind is used and that the joint is of the plain, metal-to-metal, cone type. There are, of course, no loose parts to become lost, which is a great advantage, but it must be said that the older pattern with the flat face and joint washer, as shown in Fig. 2, was really superior and provided a sure and lasting joint.

The method of fixing the union nipple to the pipe in both these instances, and also for securing a flange to a small pipe as shown in Fig. 1, is either by soldering or brazing. Although these processes are not difficult to carry out — and when the work is done properly a satisfactory joint should result—nevertheless, failure often arises from faulty workmanship. Moreover, from an industrial production standpoint, the practice might well be eliminated, and attempts to do so have led to the design and manufacture of the various kinds of so-called solderless unions. In one of these, as shown in Fig. 4, instead of the cone being formed upon the union nipple it is machined on the body of the union itself, usually at an angle of 60 deg. The pipe is flared to the same angle and is then pulled against the male cone by means of the sleeve which is shouldered to engage with the recess in the union nut. The example shown in the illustration is of American origin, and was taken from an aircraft oxygen supply fitting. The body is formed from an aluminium alloy stamping, the sleeve is of brass, and the piping and union nut are also made from an aluminium alloy. The thread size is approximately equivalent to the British $\frac{1}{4}$-in. gas thread.

This form of solderless union is extremely simple; but it is none the less effective, for it will withstand high pressure. It is interesting to note that, on assembly in aircraft, all parts were put together with a particularly tenacious form of plastic material, presumably as a safeguard against possible leakage under high pressure.

The union depicted in Fig. 5 is of a type commonly employed and is also of the solderless variety. Here, a brass olive-shaped nipple,

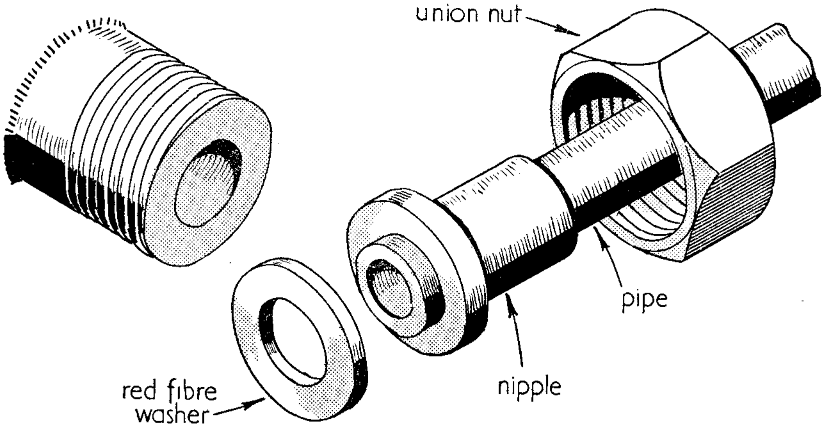


Fig. 2. Flat-faced union

coned at either end, is gripped by corresponding internal cones formed in both the union body and the nut. The compressing force applied to the olive causes it to close upon the pipe which is then held firmly and a perfect seal results. So great is the constricting effect of the olive that, in a union of this type fitted to a petrol pipe, it was found that the bore of the pipe had been reduced in diameter by 1/32 in. It will be clear from this experience that no soldering is required to form a satisfactory joint with this form of nipple ; but care must be taken to ensure that there is a sufficient length of pipe projecting through the olive so that it can obtain a proper seating.

A solderless union which dispenses with the specially-machined brass olive is the " Simplifix " as used by the Calor Gas Co. In this union, as will be seen in Fig. 6, a soft copper sleeve is compressed between two internal cones formed in both the body of the union and in the pressure washer that fits inside the union nut. By tightening the union nut, the copper sleeve is forced into close contact with the pipe and so forms a tight joint between the latter and the union body.

Making Unions

It is often necessary to make parts for unions in the small workshop, either when fitting piping or to replace some defective part. Unquestionably, the simplest kind to make is that shown in Fig. 4, since there is no union nipple to machine ; instead, the end of the pipe is flared by gripping it in the simple fixture shown in Fig. 7 and 8, and then belling out the mouth by means of the 60-deg. coned punch seen in the illustration. An example of a $\frac{1}{4}$-in. copper pipe treated in this way is shown in Fig. 8. The jig shown in the illustrations is made to take pipes of $\frac{3}{16}$ in., $\frac{1}{4}$ in. and $\frac{5}{16}$ in. outside diameter, as these are, perhaps the sizes most commonly used. The fixture is composed of two pieces of $\frac{3}{4}$ in. $\times$ $\frac{3}{8}$ in. mild-steel clamped together by two $\frac{3}{16}$ in. studs fitted with wing-nuts. Three holes, $\frac{3}{16}$ in., $\frac{1}{4}$ in. and $\frac{5}{16}$ in. diameter are drilled and reamed through the material, on the line of the joint, and are afterwards countersunk at an angle of 60 deg. until the mouths of the holes measure 9/32 in. 11/32 in. and 13/32 in. diameter, respectively. The two parts forming the body of the device are then case hardened. In use, the pipe to be flared is put in the jig and secured in place by tightening the wing-nuts. The fixture is then gripped in the vice and the end of the pipe is belled out by drifting the punch with a hammer. Whilst still in the jig the end of the pipe is filed flush, using an old file for the purpose. This will ensure that the flaring is uniform when a batch of pipes is dealt with in this way.

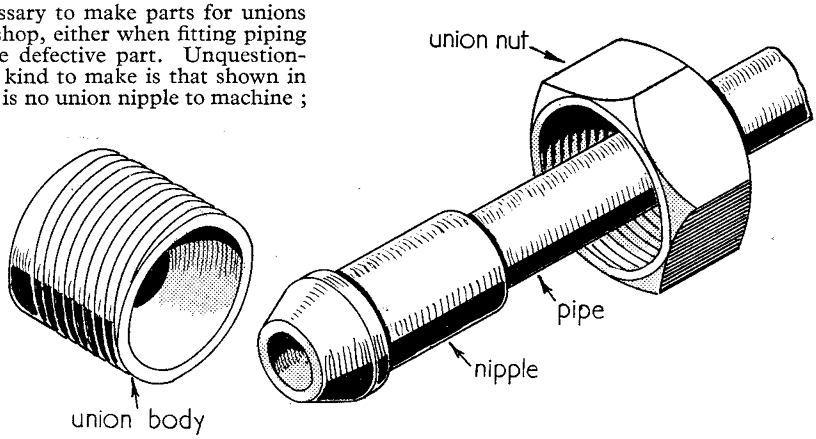


Fig. 3. Cone union

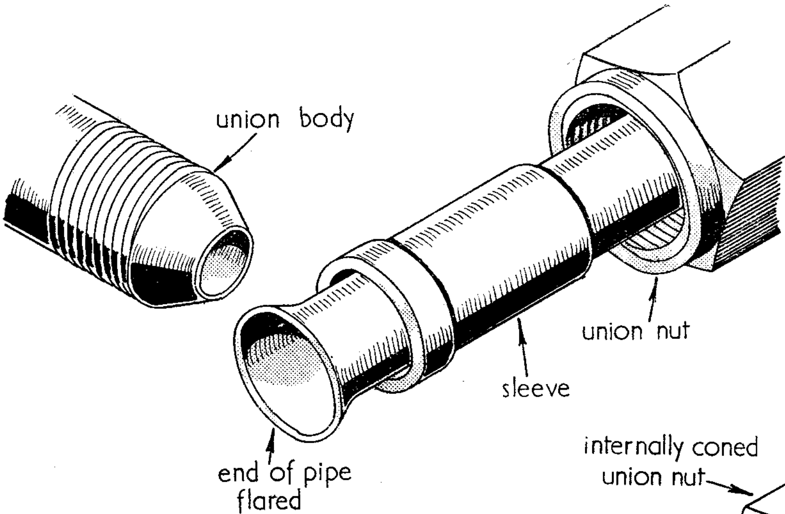


Fig. 4. Simple solderless union

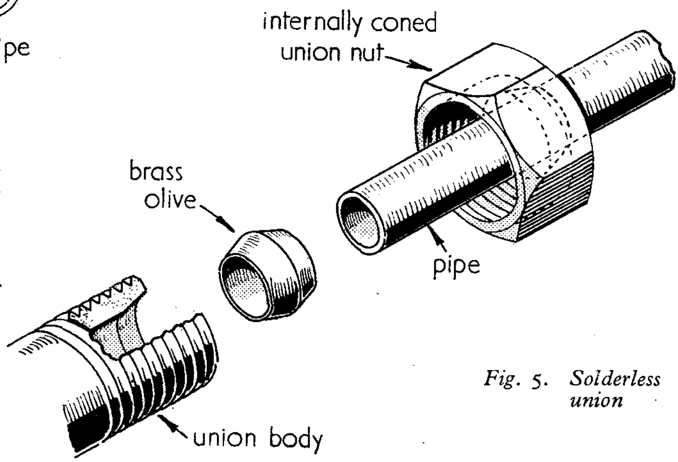


Fig. 5. Solderless union

In Fig. 9 are shown the dimensioned drawings for making this simple device. It will be seen that the two $\frac{3}{16}$-in. Whitworth studs are left of ample length so that the jig can be opened out sufficiently to allow the pipe to be removed without taking the tool apart. The punch, details of which appear in Fig. 10, is made from a 3-in. length of silver-steel and is hardened and tempered at its point to a dark straw colour. To provide a finger hold, it is advisable to knurl the body of the punch as shown in the illustrations.

After all the parts of the jig have been made, and before case-hardening the body, it will be advisable to test the grip afforded by tightening the wing-nuts. This may be done by putting a piece of pipe in the appropriate hole and endeavouring to turn it.

If the pipe can be moved easily the face of the plate not fitted with studs should be filed until the pipe can be gripped firmly. Even then, when the jig is in use, it may still be possible to drive

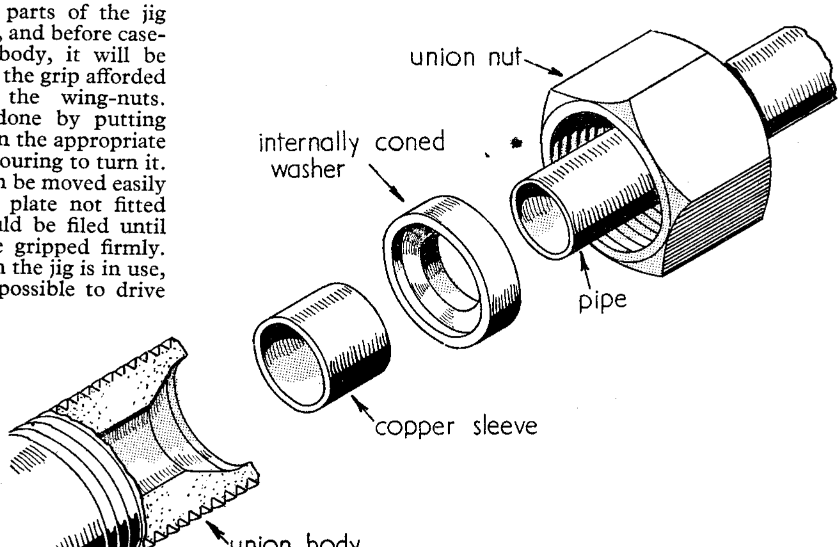


Fig. 6. The component parts of the " Simplifix " union

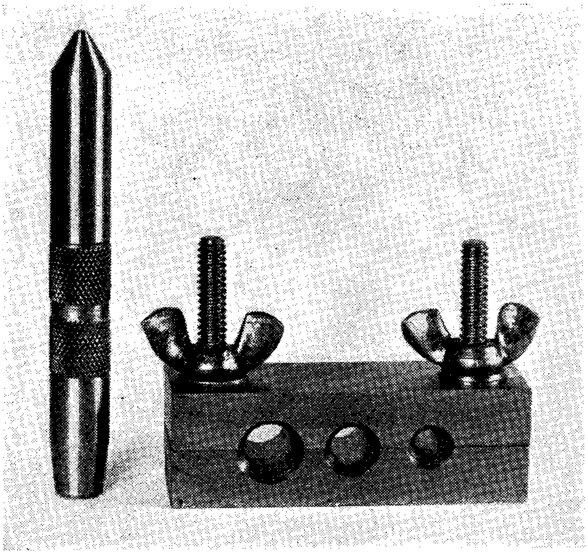


Fig. 7. A simple fixture and punch for flaring pipes

the pipe downwards ; but this is of no moment because, with a well annealed pipe, sufficient flare should be formed in the initial hammering to prevent further movement. To increase the amount of belling out, the wing-nuts are slackened and the pipe is pushed forward to allow the punch to widen the flare.

Machining Unions

The threading of a union body, which is subsequently to be soldered or brazed to a container, can be carried out from the lathe tailstock before the union itself is parted off from the material gripped in the chuck. Bodies threaded at each end are best made with the aid of a threaded adapter which is held in the lathe chuck so that the machining can be easily and correctly carried out and ensures that the parts are accurately mounted. The method illustrated in Fig. 11A and 11B, where the machining of both single- and double-ended union bodies is depicted. It will be observed that, as the union body is made from hexagon material it is a simple matter to unscrew it from the adapter when the machining operations have been completed.

The sequence of operations for machining a union body with a thread at one end only is shown in Fig. 11A. The dimensions of the part are best obtained from a sample union, as this will ensure interchangeability with standard commercial fittings. After a piece of hexagon brass rod, of the correct size across the flats, has been gripped in the self-centring chuck, a right-hand knife tool, mounted in the top slide turret, is used to face the end of the bar and to turn the body to the correct diameter for screw threading, Operation 1. A Slocombe centre-drill is next mounted in the tailstock chuck and the bar is centred, Operation 2, to enable the hole through the body to be drilled centrally, Operation 3.

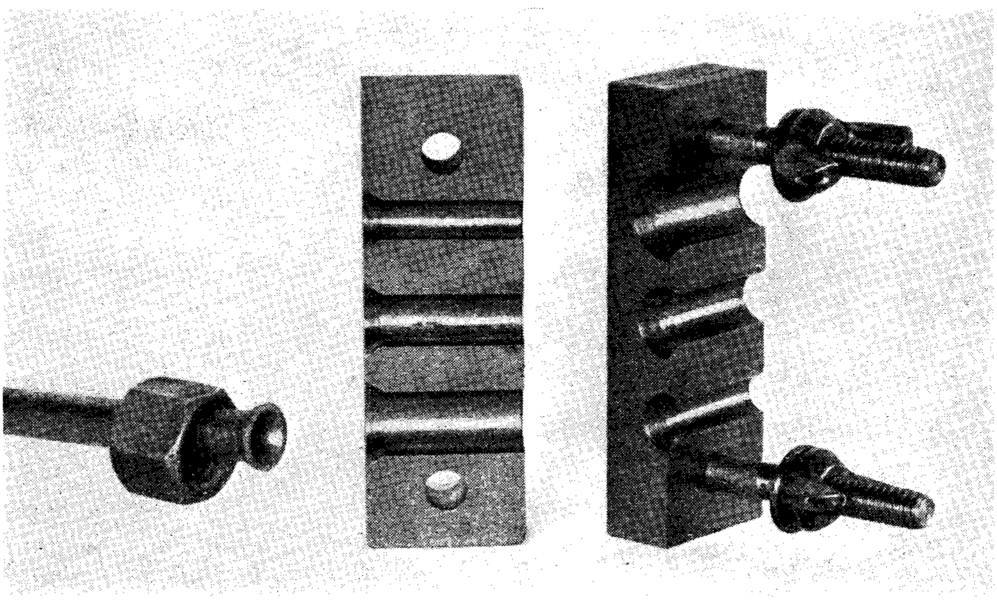


Fig. 8. The fixture opened out to show the general construction

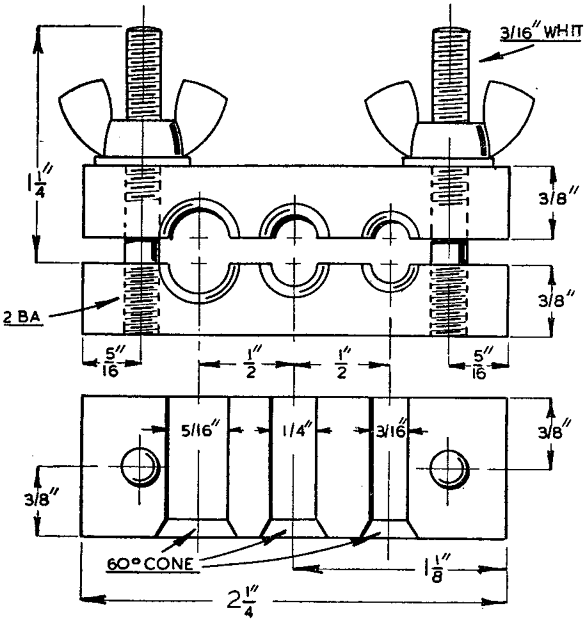


Fig. 9. *Details of swage block*

The depth of this hole must be in excess of the total length of the finished component to avoid the necessity of drilling further after parting-off. The turret is now turned to enable the special chamfering tool to form the cone on the nose of the body, Operation 4, and it should be noted that, on light lathes, this procedure can only be adopted for bodies of small diameter, for any lack of rigidity in the tool mounting or in the headstock will cause chatter and malformation of the cone. It is best, therefore, when large bodies are to be coned in a light lathe, to set the top slide over to 30 deg. and to turn the nose with the right-hand knife tool used for Operation 1.

After the coning has been completed, the drill chuck is removed from the tailstock and replaced by the tailstock die-holder so that the body can be threaded, Operation 5.

A chamfering tool, set in the back toolpost, is now brought up to the work and a chamfer is machined on the shoulder of the hexagon material, Operation 6.

The turret of the back toolpost is next rotated to allow a parting-tool to be used for carrying out the two remaining operations. In the first operation, No. 7, the short spigot is machined to the required diameter at the correct distance from the face of the body. When this has been completed the union body is parted-off to length, Operation 8.

If more than one union body is to be made, a note should be taken of the cross-slide index readings for the two diameters that have been turned, as this will facilitate the work on the remainder of the batch and will, at the same time, ensure uniformity in machining. Longitudinal dimensions are best taken with a rule, for the degree of accuracy required is not such as to warrant the more precise measurements obtainable by using the feed-screw indexes.

Machining Double-ended Union Bodies

When union bodies having threads at each end are to be made, Operations 1 to 5 as for a single-ended union are first carried out and the component is then parted off, leaving sufficient material to form the second threaded portion which is then machined in accordance with the drawings in Fig. 11B. Here, it will be seen that the body is mounted in a screwed adapter held in the chuck, Operation 6. This adapter is turned from a suitable piece of hexagon material gripped in the self-centring chuck, and it is drilled and tapped in the lathe to hold the union body during machining. A centre-punch mark is made on the adapter opposite No. 1 chuck jaw so that, at any time, the adapter can be replaced in the chuck and will then run truly.

After it has been screwed into the adapter the part is turned to the correct diameter for threading and, if necessary, it should also be faced, Operation 7. The chamfering tool in the back toolpost is now turned into position and the corner of the component is well bevelled, Operation 8, before being threaded from the tailstock, Operation 9. The die-holder is now removed from the tailstock and is replaced by the drill chuck to enable the end of the body to be centre-drilled, Operation 10, and, finally, drilled clear through.

Undercutting

It should be noted that an undercut is sometimes machined to allow the die to finish the thread cleanly; if this is desired, the operation can be carried out by using the parting tool mounted in the back toolpost. This undercutting to relieve the end of the thread should follow the operation for turning the part to size and should be carried out before the thread is cut. Where a female cone has to be machined on the end of a union body, instead of the male form of cone previously described, this 60-deg. internal

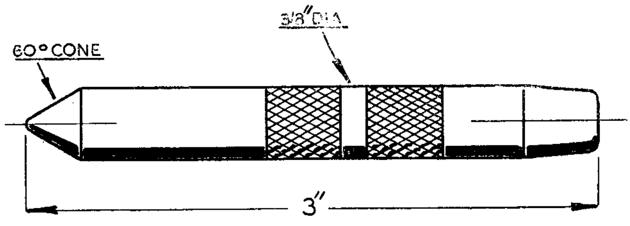


Fig. 10. *Punch for swage block*

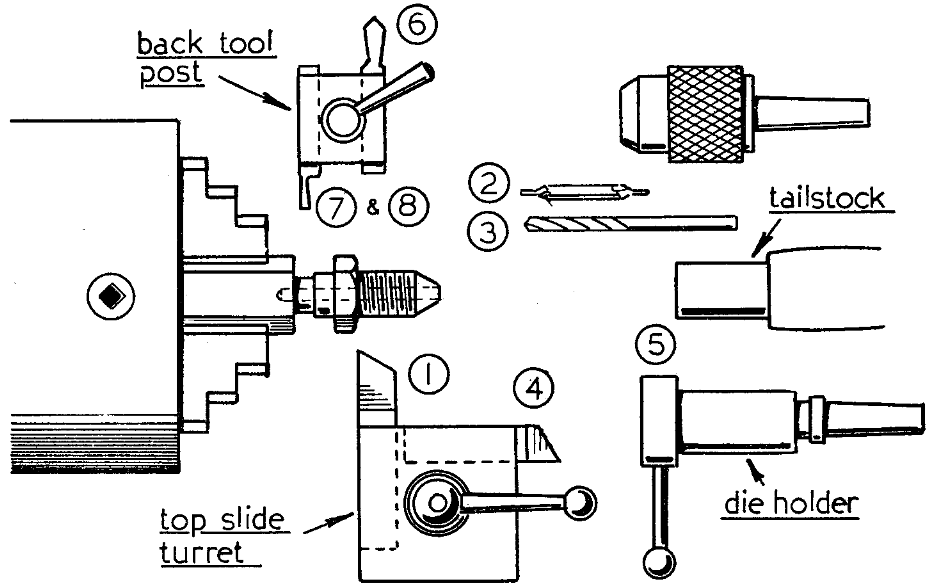


Fig. 11A. *Machining single-ended union bodies*

cone is machined with the aid of a centre drill.

The diameter of Slocombe drill used must, of course, be at least equal to the outside diameter of the nipple cone, otherwise a shoulder may be formed in the nipple seating.

(*To be continued*)

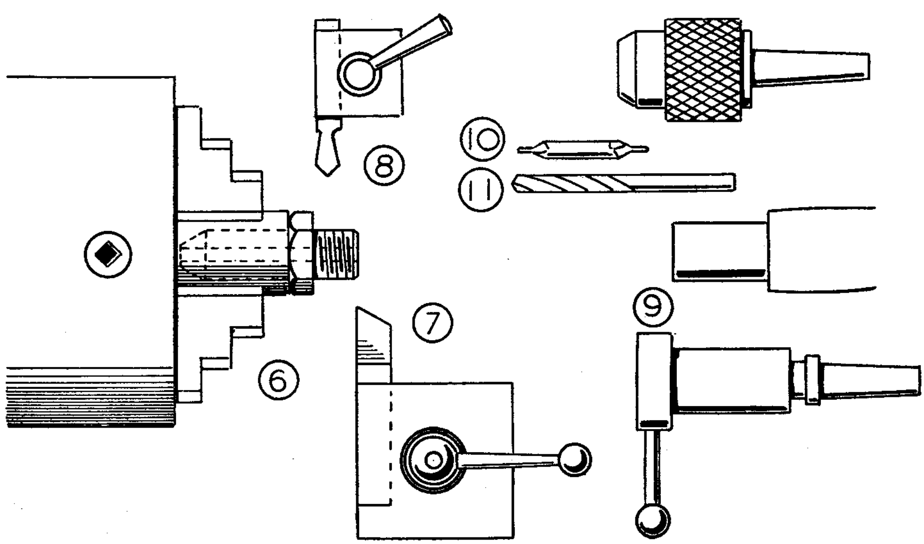


Fig. 11B. *Machining double-ended union bodies*

Queries and Replies

Enquiries from readers, either on technical matters connected with model engineering, or referring to supplies or trade services, are dealt with in this department. Each letter must be accompanied by stamped, addressed envelope, and addressed: "Queries Dept." THE MODEL ENGINEER, 23, Great Queen Street, London, W.C.2.

Queries of a practical character, within the scope of this journal, and capable of being dealt with in a brief reply, will be answered free of charge.

More involved technical queries, requiring special investigation or research, will be dealt with according to their general interest to readers, possibly by a short explanatory article in an early issue. In some cases the letters may be published, inviting the assistance of other readers.

Where the technical information required involves the services of an outside specialist or consultant, a fee may be charged depending upon the time and trouble involved. The amount estimated will be quoted before dealing with the query.

Only one general subject can be dealt with in a single query; but subdivision of details into not more than five separate questions is permissable. In no case can purely hypothetical queries, such as examination questions, be considered within the scope of this service.

No. 9820.—Camera Gun G 65
L.J.T. (Cheam)

Q.—Will you please answer the following queries on the conversion of the camera gun?

(1) Is the shutter speed dependent on the motor speed? i.e. The faster the motor revolves, the faster the exposure and vice versa.

(2) If the shutter is independent, can the exposure be varied to suit lighting conditions?

R.—(1) The shutter speed of any normal type of cinematograph camera is dependent on the motor speed, but some governing device is usually employed to ensure that the motor speed is constant or capable of being regulated to run at certain definite set speeds. In this particular case, the motor is equipped with a centrifugal switching device which maintains a constant speed under all conditions.

(2) There is no means of varying the shutter speed on this particular type of camera, neither is it possible to vary the lens aperture, but the particular work for which these cameras were designed did not necessitate these adjustments, reliance being placed on the wide latitude of the film to cope with either under- or over-exposure.

No. 9817.—Pickling a Boiler
J.L.P. (Bristol)

Q.—*Re* boiler making for model locomotives. In "L.B.S.C.'s" description of the boiler for *Diana* he advises "pickling the boiler after brazing." What does one use for a pickle? Is it effective when the job is cold, and if not, is it effective if the job is reheated after allowing it to get cold? Has the pickling to be done after silver-soldering and if so, does my second question still apply?

R.—In reply to your enquiry, you should prepare a pickle bath in some earthenware container or a wooden box lined with sheet lead and large enough to take the boiler shell easily. You then require a solution of commercial sulphuric acid and water, in the proportion of one part acid to about twenty parts of water. The mixture should be made by slowly adding the acid to the water, not the other way round.

The pickling of the boiler should be done immediately after the brazing and silver-soldering are finished. The job should be allowed to cool down to black and then *slowly* dipped into the pickling bath. There may be a certain amount of bubbling and splashing, so that it is advisable to protect your clothing with some kind of shield when the boiler is being lowered into the pickle bath.

Leave the boiler in the pickle for about twenty minutes then lift it out and wash it thoroughly in running water. After that, clean it all over by rubbing with a handful of some scouring material, such as steel wool or, if this is not available, some of the commercial scouring powders like "Vim" or "Mirro," rubbed on vigorously with a nail brush will be quite effective. Then lay the boiler aside to dry thoroughly.

No. 9918.—Air Pump for an Aquarium
C.R.P. (Ilford)

Q.—Would you advise me as to the type of small air pump suitable for an aquarium 2 ft. × 1 ft. × 1 ft.? The one I have in mind is piston-operated with non-return valves, etc. I believe the motor required is 1/40 h.p.

R.—For the particular purpose to which you intend to apply this pump, there are several very simple devices which might be used. Some of the commercially made pumps for aerating aquariums resemble small oscillating steam engines, and as a matter of fact, a small steam engine could be used for this purpose with practically no alteration. It would need to be driven through reduction gearing from the motor, and the particular speed would depend on the volume of air to be supplied. In other cases, a small bellows is used for the purpose, actuated by a crank or eccentric and reduction gear.

Yet another possible type of pump is a rotary pump of the eccentric vane type, and we may mention that a pump of this type was described in THE MODEL ENGINEER, by "Duplex," in the May 4th 1950 issue, though the dimensions of the pump are greater than you would require.